Report of the Work of The Rubber Research Board in 1953

(Established under the Rubber Research Ordinance Chapter 302)

June, 1954

COMMONWEALTH MYCOLOGICAL INSTITUTE
16 FEB 1955

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REPORT OF THE WORK OF THE RUBBER RESEARCH BOARD IN 1953.

THE present report is the twenty third annual report of the Rubber Research Institute of Ceylon as constituted under the Rubber Research Ordinance (Cap. 302) and amended by the Rubber Research (Amendment) Acts No. 27 of 1948 and No. 30 of 1951.

The Ordinance was further amended during the year by the Rubber Research (Amendment) Act No. 50 of 1953, the effect of this amendment being to make the Rubber Controller an ex-officio Member of the Board and the Deputy Secretary to the Treasury a member in place of the Minister of Finance.

CHAIRMAN'S REPORT

Board Membership—The three-year period of membership of Mr. R. J. Hartley terminated on 1st January and he was renominated for a further period.

Mr. L. J. de S. Seneviratne, Deputy Secretary to the Treasury, was nominated to represent the Minister of Finance with effect from 21st March in place of Mr. R. H. Wickremasinghe.

Mr. B. Mahadeva, Rubber Controller, assumed membership with effect from 21st December on the passing of amending Ordinance No. 50 of 1953.

Senator C. F. W. Wickremasinghe was given leave of absence from meetings from 25th May to 30th September.

The personnel of the Board at the end of 1953 was as follows :—

Ex-Officio Members :—

The Director, R.R.I.C.—Dr. H. E. Young (Vice Chairman).

The Director of Agriculture—Dr. A. W. R. Joachim.

The Deputy Secretary to the Treasury—Mr. L. J. de S. Seneviratne.

The Rubber Controller—Mr. B. Mahadeva.

Nominated Members :—

Representing the Senate—Senator C. F. W. Wickremasinghe.

Representing the House of Representatives—Major Montague Jayawickrema, M.P.

Representing the Smallholders—Gate Muhandiram Arthur D. S. Jayasinghe.

Representing the Planters' Association of Ceylon—Mr. R. J. Hartley, M.C. and Mr. G. H. Dulling.

Representing the Low Country Products Association—Mr. W. P. H. Dias, J.P. (Chairman) and Mr. W. Herbert de Silva.

Meetings of the Board were held on 26th January, 23rd February, 30th March, 18th May, 6th July, 17th August, 26th October and 21st December.

Committees

Experimental Committee—There were no changes in the personnel of this Committee which, at the end of the year, was as follows :—

Mr. W. P. H. Dias, J.P. (Chairman)
Mr. R. J. Hartley
Dr. A. W. R. Joachim
Mr. G. H. Dulling
Gate Muhandiram Arthur D. S. Jayasinghe
The Director (Dr. H. E. Young)

Meetings of the Committee were held on 12th January, 27th April, 3rd August and 3rd October.

Smallholdings Committee—The personnel of this Committee remained unchanged during the year. It consists of :

Mr. W. P. H. Dias, J.P. (Chairman)
Gate Muhandiram Arthur D. S. Jayasinghe
The Director (Dr. H. E. Young)

A meeting of the Committee was held on 12th January.

Ad hoc Committees—A Committee consisting of Mr. W. P. H. Dias, Dr A. W. R. Joachim, the Director (Dr. H. E. Young) and the Botanist (Mr. C. A. de Silva) was appointed to interview candidates for appointment as Research Assistant (Botany).

A meeting of the Committee was held on 13th November.

Liaison with other Organisations

London Advisory Committee for Rubber Research (Ceylon and Malaya)—The Board contributed jointly with the Rubber Research Institute of Malaya to the cost of research on the quality and utilisation of raw rubber carried out at the Imperial Institute, London, under the control of the London Advisory Committee for Rubber Research (Ceylon & Malaya).

Meetings of the Committee and Sub-Committees were held as follows :—

London Advisory Committee—8th May and 30th October.
Technical Sub-Committee—26th March.
Executive Committee—9th January and 2nd October.
Latex Sub Committee—29th June.

British Rubber Producers' Research Association—The Board joined in the Government contribution to the British Rubber Producers' Research Association which was resumed after a few years.

FINANCE

Income—The Board's main income was derived from the cess on exports of rubber under Section 6 (1)a of the Rubber Research Ordinance. Income from this source exceeded the estimate for the year by Rs. 208,225/-.

Monthly cess collections were as follows :—

			Brought forward	Rs.	604,341
January	Rs.	206,093	July	,,	75,384
February	,,	47,695	August	,,	119,887
March	,,	101,526	September	,,	73,260
April	,,	95,699	October	,,	108,850
May	,,	87,620	November	,,	145,147
June	,,	65,708	December	,,	66,955
Carried forward	Rs.	604,341	Total	Rs.	1,193,824

A profit of Rs. 58,063/- was derived from the normal working of Dartonfield Group.

Expenditure—Current expenditure amounted to Rs. 1,050,063. The surplus of income over expenditure for the year was therefore Rs. 496,875.

Capital expenditure amounting to Rs. 795,478 was incurred during the year, the main items being : Agricultural Development Rs. 222,946/-, Buildings and lines Rs. 222,844/-, Furniture and Fixed Equipment Rs. 23,655/-, Power and Water Supply Rs. 21,784/-, Machinery and Tools Rs. 273,959/- and Laboratory Apparatus Rs. 30,288/-.

Accounts—The accounts for the year with a Balance Sheet showing the property and liabilities of the Board will be prepared and submitted to the Auditor General for examination.

Technical Reports—The Director's report, which embodies the reports of other officers, is attached.

Sgd. W. P. H. DIAS,
Chairman of the Board,
Rubber Research Institute of Ceylon.

Dartonfield,
Agalawatta.
19-2-54

DIRECTOR'S REPORT FOR 1953

By

H. E. YOUNG

THE demand for advisory services from the Institute made the staff question even more critical and a severe strain on the research staff of all departments was experienced. This increase was brought about by the introduction of the Government subsidized Replanting Scheme which resulted in a spate of enquiries in regard to all aspects of planting. The reduction in price of crepe rubber resulted in many crepe making estates converting their manufacture to smoked sheet and demands for advice on smoke house construction and operation were very frequent.

An index of the amount of work involved in answering enquiries was reflected in the correspondence. The figures for this for the year were as follows:

	Inward	*Outward*
H.O. Administrative ..	4,494	3,709
H.O. Technical ..	596	550
Mycological Dept. ..	736	500
Botanical ,, ..	1,592	1,268
Chemical ,, ..	748	671
Agronomy ,, ..	430	476
Estate ,, ..	1,273	1,425
S. H. P. O. ,, ..	6,126	15,763
	15,995	24,351

Senior Staff

Dr. H. E. Young, Director, was on three months contract leave during the year.

Mr. D. H. Constable, Agronomist, was on duty throughout the year.

Dr. E. J. Risdon, Chemist, was on duty throughout the year.

Mr. C. A. de Silva, Botanist, was on duty throughout the year.

Ir. J. H. van Emden, Mycologist, was on duty throughout the year.

Mr. W. I. Pieris, Small Holdings Propaganda Officer, was on duty all the year.

Mr. C. D. de Fonseka, Administrative Secretary, was on duty all the year.

Mr. G.W.D.Barnet, Estate Superintendent was on duty throughout the year.

Intermediate Staff

Mr. L. Wijeyegunawardene, Plant Breeder, Botany Dept., took up duty on 2nd January, and continued on duty throughout the year.

Mr. D. M. Fernando, Assistant Mycologist, resumed duties on 21st September after post graduate training in Canada.

Mr. A. J. Jeevaratnam, Research Assistant (Agronomy), proceeded on a Colombo Plan Scholarship for two years at the Waite Agricultural Research Institute, Adelaide, South Australia on 21st January.

Mr. M. Nadarajah, Research Assistant (Chemistry), commenced duty on 15th December 1952 and was on duty throughout the year.

Mr. N. W. Palihawadana, Senior Assistant Propaganda Officer, was on 3 months leave from 1st October to 31st December.

Mr. K. Wilson de Silva, A.P.O. (South), was on 3 months leave from 1st June to 31st August.

Mr. H. H. Peiris, A.P.O. (North), was on 3 months leave from 1st March to 31st May.

Mr. P. W. W. de Silva, Probationary A.P.O., left the service of the Institute on 30th November.

In addition a number of changes in Assistant and Minor staff occurred. These changes are shown in the respective departmental reports.

The salaried staff of the Institute at the end of the year was as follows:—

Senior	*Intermediate*	*Assistant*	*Minor*	Total
8	7	71	25	111

General

The Director served as ex-officio Vice-Chairman of the Rubber Research Board and as a member of the Small Holdings and the Experimental Committees of that Board. He also served as a member of the Rubber Replanting Board, and of the Central Board of Agriculture and on the committee of the Kalutara District Planters' Association and attended meetings of the General and Agency Section committees of the Planters' Association of Ceylon. Meetings of the Low Country Products Association were also attended.

Buildings

The extensions to the Administrative block and to the Botany, Mycology and Agronomy Departments were commenced and almost completed by the end of the year. This will provide much needed working space in accordance with the increased demands of the staff and their duties.

The extensions to the rubber factory including the drying loft and the drying tower were completed and the tunnel type smoke house almost completed. The installation of the new manufacturing machinery together with power plant and generators was also almost completed. A constant temperature room for the chemical department was completed and is in operation.

Six further double cottages for labourers were constructed at Hedigalla and a new Assistant Staff bungalow built at Dartonfield. Community centres were built at Dartonfield and Hedigalla and the Assistant Staff Chummery extended to accommodate eight unmarried officers. A school and a school master's quarters at Hedigalla and a dispensary were also constructed.

Planting

At the end of the year the cultivated acreage of the group was 661½ acres of which 226¾ acres were in tapping. The crop for the year averaged 582.5 lbs. per acre. Immature areas amounted to 415 acres of which 132 acres were planted during the year (Dartonfield 14 acres replanting, Nivitigalakele 7 acres new planting, Hedigalla 111 acres new planting).

Mr. J. D. Farquharson continued his duties as visiting agent and inspected the Group twice during the year.

The labour force for the year reached 468 of which 289 were resident.

Rubber Replanting Scheme

The Institute undertook the development of 60 acres of nursery at Egaloya for the Rubber Controller aimed at supplying planting material to participants in the Replanting Scheme. The Estate Superintendent (Mr. Barnet) superintended the construction and development of the nursery from which approximately 2,000,000 plants will be available for replanters in 1954.

Mr. H. M. Buultjens, Senior Conductor-in-Charge, was stationed at Egaloya to carry out the work.

Publications

During the year the following publications were issued :—

Advisory Circular	No. 36—Contour Lining, Holing and Filling, Cutting of platforms, Trenches and drains.
do	No. 37—Manuring of Rubber.
do	No. 38—Planting and after care of Budded Stumps and Stumped Budgrafts.
do	No. 39—Clonal Seed as Planting Material.

Combined 1st and 2nd Quarterly Circular for 1952.

,, 3rd and 4th Quarterly Circular for 1952.

Report of the work of the Rubber Research Board for 1952.

Contributions were made by the Director and members of the staff to publications by other organizations.

Visitors

Visitors to the Institute included the Hon'ble Mr. J. R. Jayewardene, Minister for Agriculture & Food and Mr. K. Alvapillai, Permanent Secretary to the Ministry of Agriculture and Food.

A number of overseas visitors representing scientific and planting interests of rubber producing and manufacturing countries called at the Institute.

The number of Ceylon visitors increased and a large number of planters and representatives of Planting Companies as well as other business interests interested in rubber production were among those who called. Several organized visits by groups of school children also occurred.

Rubber Conference

A rubber conference sponsored by the Institute and opened by the Hon'ble the Minister for Agriculture and Food was held in Colombo on 16th November.

The theme of the Conference was replanting and apposite papers on this subject were read by all departments. Dr. A. Newsam of the R.R.I., Malaya by invitation delivered a paper on root diseases.

Approximately 370 members of the Planting Community and allied organizations attended the conference which was voted a great success. A full report of the proceedings of this conference is being published in the Quarterly Circular.

Demonstrations & Lectures

Several courses in budgrafting for commercial estate employees were conducted at Nivitigalakele by the Estate Superintendent assisted by estate staff. These courses were well patronized.

A number of Oidium control demonstrations were conducted by the Mycologist in different rubber producing areas.

Lectures and talks were given by various members of the Senior Staff to district and central planting bodies.

Departmental Reports

It is pleasing to be able to report that the result of the necessarily long period of waiting entailed in breeding work is now coming to hand. The work of our predecessors in plant breeding is being successfully demonstrated by the appearance of what appear to be very useful high yielding clones which owe their origin to the work of previous officers of the Institute. Breeding for the future has been continued both by the Botany Department and the Mycology Department.

The struggle against Oidium continued and considerable advancement was made in control techniques. Manuring procedure was further investigated and the understanding of what now appear to be definite nutrient deficiency symptoms increased.

On the Chemistry side considerable progress was made, in Technical Classification of rubber, in factory effluent control, manufacture of rubber, and latex problems.

The small holdings work has received considerable praise from the community with reference to its success in helping the small holders to replant their lands satisfactorily with good material as well as improving small holdings manufacture and agriculture.

The Estate Department has had a very busy year with the large planting and building programme of the Institute as well as with field work on experimental plots on the Institute's own land and on commercial estates.

The Administrative work entailed by the large increase in the Institute's activities has become an ever greater burden on the staff concerned. The clerical and accounting officers have been greatly taxed in the efforts to keep this up to date.

Increased demands can be expected in 1954 if the services of the Institute continue to be availed of at the rate now in evidence.

Detailed reports of the work of each department as prepared by the officers in charge are presented herewith under the respective departmental headings.

REPORT OF THE CHEMISTRY DEPARTMENT FOR THE YEAR 1953

By

E. J. RISDON

SUMMARY

The report of the Chemical Department for 1953 is divided into 6 sections and a total of 22 subsections. Section 1 includes tables summarising certain aspects of the advisory services provided by the Department.

Section 2 deals with work on latex prior to coagulation and includes an account of experiments on the approximate determination of the d.r.c. of fresh latex and on the prevention of precoagulation. Further experiments with the metrolac confirm that this instrument can readily give erroneous d.r.c. figures in comparison with the trial coagulation procedure. The standard deviation of a single reading of the difference, d.r.c. by trial coagulation minus d.r.c. by the metrolac, varied between .23 and .30 lbs./gallon. Further tests with the 'aliquot sampling' method suggest that this procedure may be more reliable than the use of the metrolac. Large and small scale experiments on the prevention of the precoagulation of latex—primarily with latex intended for crepe manufacture—are described and agree with the view that proper use of the appropriate anticoagulant can readily produce a marked reduction in precoagulation, at least in certain cases.

Section 3 deals with certain aspects of the production of smoked sheet. Experiments designed to ascertain whether Ceylon crepe towers can be used to finish the drying of partially smoked sheets have been carried out and confirm that inadequately 'smoked' material can be more susceptible to mould than standard R.S.S. Mention is made of the procedure adopted by the Department in the case of requests for advice on the design and operation of temporary smoke-houses. Determinations of the apparent equilibrium moisture content of fresh R.S.S. suggest that this material can be very sensitive to the % relative humidity of the surrounding air. Much of the latest information on the use of fungicide, in particular of p.nitrophenol, for the suppression of mould on R.S.S. is summarised in subsection 3.3.

Section 4 describes experiments concerned with the production of crepes. The influence of iron on the colour of crepes made from bleached latex is considered and the performance of various partial purification units designed to reduce the iron content of factory waters, has been investigated. It seems that these units can remove much of the iron present in the waters of certain factories. The investigation into the cause of the difficulty found in the lamination of sole crepe laces at certain factories has continued, and it has been confirmed that the quality of the milling water can be important. Partially demineralised factory water, obtained by passing the water down small scale ion exchange columns, has been employed with considerable success on the last smooth mill at one of the above factories. Various fungicides have been incorporated in crepe and tested against p.nitrophenol.

Section 5 deals with the work relating to the technical classification of rubber in Ceylon. Various possible procedures and their technical implications are discussed. Provisional data available from a limited number of R.S.S. and R.S.S. bale surveys suggest that only a small proportion of the sheets

would be expected (under normal conditions) to have strain values outside the T.C. limits. None of R.S.S. bale samples tested to date fell outside the T.C. limits. Experiments designed to ascertain whether additional blending inside the packing houses would be required are in hand. The data available at present suggests that additional blending may be required, at least in certain cases. An experiment carried out with blanket crepe samples selected from various Estates suggests that first fraction samples would be expected to have markedly lower strain values than sole crepe trimmings.

Section 6 describes experiments on the 'nuisance-free' disposal of factory effluents, particularly serum, and mentions that a partial survey of the Copper content of Ceylon R.S.S. and crepe is in hand. A small scale serum decomposition plant, involving an anaerobic followed by an aerobic process, has been set in operation. While it is by no means certain that the unit is operating under optimum conditions the present undiluted final effluents appear, from the water pollution viewpoint, to be a distinct improvement over the original raw material, *e.g.* undiluted serum containing little or no rubber.

Section 1. General

1.1. *Staff*—The Chemical Department now consists of the Chemist, the Research Assistant, Mr. M. Nadarajah B.SC., (Ceylon), three Laboratory Assistants, Messrs. D. S. Muthukuda, M. T. Veerabangsa and G. G. Gnanasegaram, one Attendant and one Peon. Three to five labourers are made available by Estate Department as required. Mr. Gnanasegaram completed his period of probation in December.

The table below shows the working days of absence by the various members of the Department during the year. All the members were on duty throughout the whole year.

By	*Casual*	*Vacation*	*Sick leave*	*Lieu leave*	*Total Days*
Chemist ..	8	12	3	½	23½
Research Assistant ..	16	6	6	—	28
Lab. Assistant (D.S.M.)	12½	12	9	1	34½
(M.T.V.)	12½	17	3½	2	35
(G.G.G.)	13	11	5	3	32
Attendant (P.K.W.)	13½	12	28	7½	61

1.2. *Advisory Services, Correspondence etc.*—The volume of advisory work is again very considerable, and a very large part of the Chemist's time is occupied in visits, correspondence and examination of the literature in connection with the advisory services provided by the Department. The table below includes the number of visitors and the number of samples submitted to the Department, together with the outgoing correspondence and a summary of the number of visits by members of the Department.

(*a*)	Unsolicited samples submitted for Tests or Report ..	75
(*b*)	Solicited samples (excluding technical classification samples)	176
(*c*)	Technical Classification samples received	1,600
(*d*)	Visitors to the Department	70
(*e*)	Correspondence, outgoing, excluding Roneoed letters etc.	660
(*f*)	Roneoed letters, Pamphlets and Reports	11
(*g*)	Visits by the Staff of the Department (Details below) ..	157

By	To R.R.I.C. Estates	To other Estates	Other Visits	Total
Chemist ..	7	26	21	54
Research Assistant ..	2	14	3	19
Lab. Assistants ..	21	55	8	84

The outgoing correspondence includes various letters on technical matters drafted in the Department for signature by administrative officers. In the table of visits, the figures in the second column refer only to experiments started with latex before its arrival at the factory and to experiments at Nivitigalakele or at Hedigalla, and the figures in the third column exclude visits to Estates for the sole purpose of collecting particular samples under controlled conditions (unless such visits occupied a whole day). A total of 46 such visits were made to Estates to collect special samples and to obtain the process details required.

Advisory visits to Estates normally require the preparation of a detailed report on certain aspects of the process followed. Preparation of these confirmatory reports frequently takes more time than the visits themselves. Acknowledgement is made to the Estate Dept. for the temporary services of the Senior Rubber Maker, Mr. W. A. P. Wanasinghe, on a number of these advisory visits.

1.3 *Publications etc.*—The publications of the Institute partially or wholly contributed by the members of the Chemical Department include 2 articles in the Quarterly Circulars (28—3, 4: 3, 22) published in 1953, 2 letters to the India-Rubber Journal, the Report for 1952 and a paper for the Conference convened by the Rubber Research Board in Novermber 1953. Two further articles for the Quarterly Circulars are in various stages of preparation. Acknowledgement is made to those persons connected with the Ceylon natural rubber industry, who contributed subsections to the circulated preprint of the Conference paper mentioned above.

The Chemist briefly addressed one District Planters' Association on the subject of the prevention of precoagulation. The Chemist also summarised and exemplified with slides certain aspects of the Department's Conference paper on November 16th. Acknowledgement is made to those who assisted by making the drawings and preparing the slides.

1.4. *Miscellaneous*—The Chemist and a Laboratory Assistant undertook the annual stock-taking in the Mycology Department and a Laboratory Assistant aided members of the Botany Dept. stock-taking in the Chemical Department. These operations, required for Government Audit purposes, involved nearly a week of the Laboratory Assistant's time.

T. E. H. O'Brien's booklet 'The Preparation of Plantation Rubber in Ceylon' has been reprinted during the year. Proof-reading was carried out mainly by the Chemical Department. Acknowledgement is made to the technical offices of the London Advisory Committee for Rubber Research (Ceylon & Malaya) for advice and assistance in various matters.

Section 2. Latex

2.1. *Equipment*—More of the equipment required for work in this section has arrived during the period under consideration. The M.S.E. centrifuge has been received and the motor tested, but final installation will await erection

of the second hand A. C. generator in the engine room. The order for the Beckman spectrophotometer with flame attachment (C. P. No. 1689 p. 5) was cancelled due to the inability of the U.S. suppliers to obtain an export licence. A simple flame-photometer and abridged spectrophotometer have been obtained from alternative suppliers in the U.K. The pH meter gave satisfactory service for some six months, but is now undergoing examination in Colombo. The small 2''x 4'' Laboratory mill ordered partly for work in this section has recently been delivered, but is not yet erected.

2.2. *Approximate Determination of the d.r.c. of Fresh Latex*—Approximate determinations of the d.r.c. are required for various factory and record purposes and representatives of the Planting Associations have from time to time inquired about the accuracy of the standard type of hydrometers used for rapid, approximate d.r.c. determinations in Ceylon. This subject has already been discussed at some length previously (Ann. Report 1952 p. 11—14) and it was concluded, subject to certain basic assumptions, that the data presented were in agreement with the views that metrolac readings can be made reasonably suitable for determining the approximate d.r.c. of the bulk of a large number of tappers' latex for certain purposes (such as the estimation of the weights of bisulphite, RPA.3, acid etc. required for the bulk), but that the use of metrolac readings to calculate a tappers' daily, monthly or annual total rubber output could be misleading.

It was considered possible that the figures presented might not be sufficiently representative of the area concerned and further observations (partly by the Estate Dept. and partly by the Chemical Dept.) have been made in 1953 over the period March—April, that is shortly after the resting period, and again in June—July.The figure recorded is the d.r.c. in lbs. of rubber per gallon of latex, obtained by the trial coagulation procedure (Advisory Circular No. 17, 2nd supplement), minus the d.r.c. found using the metrolac. The provisional analysis of variance tables for the 1261 observations are shown below on the basis of tasks rather than on the basis of tappers (irrespective of tasks), as was followed in the Report for 1952.

Sampling Period 1953

	March-April		June-July		
Source of Variance	*Deg. of Freedom*	*Variance*	*Deg. of Freedom*	*Variance*	
Between Tasks (T1)	12	.306	12	1.124	D'field Task A
Days (D1)	18	.185	28	.232	
T1 × D1	216	.050	336	.024	
Between Tasks (T2)	12	.809	12	1.230	D'field Task B
Days (D2)	18	.267	29	.224	
T2 × D2	216	.040	348	.030	

Check determinations of some of the figures making up the above tables have been carried out by a second set of operators, who made their own determinations of the d.r.c. by trial coagulation. Statistical analysis of the data does not show any significant differences between the values found by the 2 sets of operators. Over another period of the observations, the work of the original operators has been checked at each stage by the second set of operators and statistical analysis shows that the standard deviation of a single value of the difference, d.r.c. by trial coagulation minus d.r.c. by metrolac, over the 'checked' period is substantially indistinguishable from the value found for the whole period of the continuous observations. It is therefore concluded that the data summarised in the table is reasonably reliable with respect to the latex involved. The data in the Report for 1952 has been reworked to the form shown in the above table and, for the various sets of 1952 and 1953 results (2052 observations), the value of the standard deviation of single readings of the d.r.c. difference varies between .23 and .30 lbs/gallon. For tasks and days the corresponding ranges of the standard deviations are .10 to .21 lbs/gallon and .11 to .15 lbs/gallon respectively. In simpler terms this means, for example, that metrolac readings used to calculate the daily or monthly output of a task can readily be considerably in error.

In these experiments the tasks have been tapped by different tappers and do not in general contain the same clones, hence the experiments do not demonstrate adequately whether a metrolac can be employed with reasonable accuracy in large monoclonal blocks where the trees are all of approximately the same age. Large monoclonal blocks of this type are not available on Dartonfield, but it is hoped to obtain information on this point by splitting a number of monoclonal tasks into sub-tasks and the appropriate experiment is in hand at Nivitigalakele with the co-operation of the Estate Department.

Estimates of d.r.c. by the metrolac are normally made by drawing off a suitable volume of latex, diluting it 1/1 or 1/2 with water and reading the metrolac value after mixing the latex and water. The instruments used for measuring the volumes required are not normally very accurate and this could obviously lead to considerable error if reasonable care is not ensured. Tests, where 8 bulks of latex are diluted and the d.r.c. estimated by the metrolac on 10 different samples of each of the bulks, give an average standard deviation between samples not exceeding .04 lbs/gal. in one case and less in a second experiment.

The suggestion has been made that the metrolac is unsuitable for use with budded rubber latex due to the fact that many budded rubber tasks require the use of appreciable amounts of latex anticoagulants, *e.g.* ammonia. Tests, whereby the latex from 5 different tasks on 4 days was ammoniated to 0%, .05% and to .1% prior to estimation of the d.r.c. by the metrolac after dilution, showed a slight change in d.r.c. in the presence of ammonia but the differences were not statistically significant. The proportion of ammonia recommended as an anticoagulant in Advisory Circular No. 17 is of the order of .01—.02% on the latex and, although this proportion may well be exceeded, values in excess of .1% are probably unusual unless the latex is to be concentrated. The data is not therefore in agreement with the suggestion that the addition of small amounts of ammonia render the metrolac highly inaccurate.

As has been noted in the Report for 1952, O.de Vries in 1920 (and possibly others earlier) pointed out that the only sure way known at present to determine the rubber content of latex is actual coagulation of the latex and weighing the rubber, Nevertheless trial coagulation of the latex is by no means the

standard procedure in Ceylon. The objection that the official procedure presupposes the presence of mills capable of rolling the coagulum thin enough to dry overnight in a standard crepe tower, is catered for in B.S. 1672 : Part I : 1950 and in Malaya, where hand milling using a photographic roll or a bottle (*e.g.* whisky bottle full of water) is suggested and followed by drying at 70°C. Since such milling might be less effective than mechanical sheeting, tests have been made on 9 samples of fresh latex and 5 samples of ammoniated latex to compare the d.r.c. values obtained by mechanical sheeting and by 'bottle milling', using in both cases about 50 grams of latex and drying at 70°C. The provisional analysis of variance shows no significant difference between the two procedures and it has been tentatively concluded that the company which inquired about this matter and which was selling ammoniated latex is probably fully justified in using bottle milling. It is perhaps worth recording that when the lace was dried in a warmed air crepe tower, the final d.r.c. was slightly, but just significantly, higher.

The d.r.c. of latex as received from the field depends *inter alia* upon the weather prevailing at the time of tapping *e.g.* on partial washouts etc. When the d.r.c. is low, there is a possibility that the value obtained might be low due to a decrease in serum substances present in the coagulum. Tests with 7 samples of field latex, where the (duplicate) subsamples have been diluted to approximately 10%, 20% and 30% d.r.c. after weighing but before coagulation and mechanical sheeting, failed to show a significant dependence of the actual d.r.c. value upon the d.r.c. at coagulation.

The experiments with the aliquot sampling method, whereby the daily biscuits resulting from the coagulation of samples of the tappers' latex are stored together before being milled, have continued. The experiments started in 1952 as a result of the suggestion of a Superintendent that storage of biscuits, prior to milling together several days' biscuits, would save time and trouble. Successful use of this method requires that the tapper's latex shall be sampled on a proportional basis, such as 2 millilitres per 1 lb of latex, or as convenient. The procedure may be of value when the aliquot sample may be stored for 4 to 5 or more days as ammoniated latex and then subsampled for d.r.c. testing. In various check tests the total dry rubber turned in by a number of tappers (not all tapping the same clone) has been determined over 4 or 5 day periods by the (daily) trial coagulation procedure, by the aliquot sampling method (for ammoniated latex) and by the metrolac. The standard deviation for tappers of the difference, total pounds of rubber estimated by trial coagulation minus the pounds of rubber estimated by the aliquot sampling procedure as a % of the weight by trial coagulation, is 2.9% whereas with the metrolac the corresponding figure is 12.0%.

2.3. *Prevention of Precoagulation*—The correspondence with Estates on this subject has continued to increase since 1952. Discussion of the theory underlying the natural coagulation of Hevea Latex and of the practice of the prevention of precoagulation is to be found widely scattered in the journals and literature of, at least, the last 30 years. From time to time the R.R.I.C. has distributed short advisory circulars describing the chemicals intended for the prevention of precoagulation and giving some information on how they may be employed commercially. From the more recent correspondence it appeared that a number of Estates have experienced difficulties in applying the suggestions given in these circulars to their conditions.

In 1952, therefore, experiments were started to obtain information on the behaviour of latex from various clones at the R.R.I.C., when some of the

anticoagulants suggested in the literature are applied. These experiments have continued in 1953 and the tentative conclusions drawn include the following: (*a*) the various standard anticoagulants suggested in the literature, *e.g.* advisory circulars, are at least partially effective or can usually be made partially effective. However, satisfactory results could not always be obtained with old stocks of formalin, even when neutralised with alkalis. (*b*) Depending upon the final product, the concentration of anticoagulant to be employed can be rather critical. Insufficient anticoagulant can be a waste of money and a large excess, particularly if the excess is not known from day to day, can introduce difficulties in processing, such as control of the size of fraction taken in crepe manufacture. (*c*) There can be distinct differences in tendency to precoagulation between clones, between days within a given tapper's task and possibly between districts or areas for the same clone. (*d*) The addition of aqueous bark extract to latex can enhance the tendency to precoagulation and clean, dry cups (*i.e.* with the scrap properly removed) appear preferable to dirty, wet ones, For experimental purposes 2 cups per tree are often used. (*e*) Comparison of various anticoagulants (in terms of time to complete or nearly complete coagulation), has shown that the addition of standard anticoagulants to the bucket only, rather than to the cups and to the buckets, can be a waste of money, in so far that very little improvement (compared to the use of no anticoagulant) may be found at least in some cases.

In general, the conclusions are not scientifically new but the work carried out greatly assisted in showing where Estates can 'go wrong' on this subject and in framing the advisory correspondence accordingly. In the early part of the year the Sabaragamuwa District P.A. pointed out that a number of Estates in their District were experiencing considerable difficulty in controlling the precoagulation of latex from areas of TJ.1. In due course a Laboratory Assistant of this Department was stationed at an Estate near Kahawatta to carry out suitable experiments with the Estate concerned on an area (about 108 acres) of a 1936—1939 TJ. 1 clearing. The latex from this Division is weighed up at a Divisional centre and transported about 2 miles by lorry to a central factory for manufacture into crepe. The earliest small scale tests showed that about .12% of sodium carbonate or about .2% of sodium sulphite, (calculated on the weight of latex), under adequately supervised conditions could reduce the % precoagulum from a figure of about 20—25% (no anticoagulant) or 10—20% (estimated 'standard' Estate figure) to under 5%. For reasons of availability, ease of handling and cheapness, the bulk of the remaining experiments were made using .12% washing soda powder (impure sodium carbonate) and the number of tasks in the experiment was gradually increased mainly by the Estate concerned.

On the basis of an output of 4 gallons per tapper, the procedure followed required each tapper to be issued with just under 1 pint of 3.3% washing soda solution (1 lb of chemical per 3 gallons of water) and to use the correct amount of 2/3 of this volume on the cut and in the cups of each tree (say about 0—4 drops on the cut and about 2—4 drops in the cup depending upon the circumstances). The remaining 1/3 of the anticoagulant was placed in the collecting bucket after collection from about 20 trees, and a further .02% of washing soda was added at the weighing-up centre. As far as is known, the Estate now uses .08% washing soda in dry weather and .12% in wet weather. The solutions required for .08% washing soda may be made by dissolving 1 lb. of chemical in 4 gallons of water, when about 1 pint of solution would be added to every 4 gallons of latex. A brief description of the experiment was presented, with the approval of the Superintendent concerned, Mr. J. W. Craig C.D.A., at a meeting of the Sabaragamuwa District P.A. at the end of June.

2.4. *Miscellaneous*—Only limited further tests on the use of the total solids test to calculate the d.r.c. of fresh or ammoniated latex have been made, since, as far as is known, there is at present little evidence to suggest that this procedure is likely to be followed by organisations buying latex. Various tests have been made to determine the rate of production of the small de Laval Centrifuge. No further work has seemed necessary or has been carried out on the test procedures used for the determination of the d.r.c. of ammoniated latex.

Section 3. Smoked Sheet

3.1 *General*—In the early part of the year the advisory correspondence has been largely concerned with the prevention of the formation of bubbles and of the discolouration usually associated with enzymatic action. During the second half of the year there has been a marked increase in correspondence relating to the construction and operation of permanent and temporary type smoke-houses suitable for Ceylon conditions.

The R.S.S. milling and smoking facilities, under construction by Messrs. Brown & Co. Ltd. for experimental and production purposes at Dartonfield are expected to be available early in 1954. The facilities consist of a Brown's Guthrie Cadet Sheeting Mill with a tunnel type smoke-house of nominal capacity 350 lbs/day and with a smaller drying and smoking unit of capacity about 50 lbs. Both smoke-houses are equipped for the production of air dried sheet or lace, using as heating source a Messrs. Colombo Commercial Company's oil fired direct heater. The capacity of this tunnel type unit should be capable of extension to at least 700 lbs/day, with only a minimum of trouble and expenditure, when required. Both units are to be employed for drying and smoking tests, experiments in connection with technically classified rubber and for demonstration purposes.

3.2. *Drying and Smoking*—The premium paid by the People's Republic of China for Ceylon R.S.S. compared to the Singapore price, together with a decline in the price of blanket crepe has meant that more and more producers are turning from blanket to R.S.S. production. The number of inquiries on the operation and construction of smoke-houses has therefore shown an increase. Various Estates have inquired about the conversion of standard multi-storey R.R.S. type crepe drying towers to smoking and drying towers. After consultation with local engineering and construction companies, the inquirers have been advised that, in our opinion, the conversion ought not to be either too difficult or costly, but that reconversion at a later date back to lace drying towers might require complete removal of the reapers and the racks, and extensive scraping of the walls followed by replastering.

The information available suggested that comparatively few Estates contemplated conversion of their crepe drying towers to R.R.S. type smoke-houses, so that it seemed desirable for the R.R.I.C. to ascertain, using budded rubber latex, whether such Estates might be able to save expenditure by employing only small size smoke-houses completing the drying (without smoke) in the standard type crepe drying towers, operated at elevated temperatures. While information on the subject of air as opposed to smoke dried sheet is available in the early literature, it was considered desirable to extend this to the particular application in mind. Experiments on this point have been carried out at Nivitigalakele, where a considerable portion of different days' crop was smoked for 1 to 8 days in the small standard R.R.S. smoke-house at the Division prior to further air drying without smoke in the Dartonfield crepe lace tower operated at temperatures between 105°F and 121°F,

usually well above 110°F. The sheets obtained were of acceptable quality, although some were markedly lighter than is usual. The sheets have been stored for examination for susceptibility to mould and none of the sheets showed mould on 'normal' storage for 3 weeks. However, on examination about 6 weeks after the conclusion of smoking, the sheets smoked for much less than 4 days showed appreciable mould in the material in contact with the floor and with the outside air (*e.g.* the edges of many of the sheets and the top sheet), whereas the sheets smoked for 5 -8 days were substantially mould-free with the exception of odd portions of the material in contact with the floor. Estates have been advised, therefore, that partly smoked R.S.S. might be suitable provided the loose R.S.S. is packed, talced and painted, and shipped very soon after smoking, but that under the conditions used a *considerable* reduction in the time the material spends in smoky atmosphere produces a sheet that is more susceptible to mould than the standard and as such could, under unfavourable circumstances, represent a distinct risk. Recent information suggests that sheets smoked for about 4 days, prior to final drying (when necessary) in a tower, can be quite acceptable at least under certain conditions. The evidence available does not suggest that any of these partially air-dried sheets had an unusually high water content at the conclusion of drying and it is to be presumed that incorporation of p. Nitrophenol would greatly decrease their susceptibility to mould (*Vide* Subsection 3—3). Further experiments on this subject may be carried out when alterations intended to increase the temperature in the crepe drying tower, are completed.

A number of inquiries have been received concerning the theoretical time of drying in R.R.S. type smoke-houses and it is of interest to record that during the course of the above experiments the moisture content of 9 subsamples from 3 different sheets/day has been determined each day on the R.S.S. in the smoke-house. The figures suggest that the average moisture content fell to about .25% in 5 days and to under .1% in 6 days. The data is in agreement with the view that properly operated R.R.S. smoke-houses should dry normal R.S.S. in not more than 5—6 days, a point which has been disputed in the incoming correspondence. It is not considered that this smoke-house was operating under optimum conditions. Examination of a limited number of commercial permanent type smoke-houses shows that the defects of these R.R.S. units were primarily the fault of the operators, *e.g.* no adequate temperature control and inadequate ventilation. During 1954 it is intended to carry out experiments to ascertain whether the capacity of the R.R.S. type smoke-house can be substantially increased by replacing the fire trolley in the ground floor by racks of sheets using a furnace with an underground flue network. The necessary preliminary work for this is in hand.

The Department has had a number of requests for details of large cheap temporary type smoke-houses. As a matter of policy, the Department has invariably been extremely reluctant to advise on the type of construction material most suited to Ceylon's needs. From an examination of the literature it appears that the cheapest unit would probably be one based on jute hessian with cadjan outer protecting walls and roofing. In Ceylon, however, daub and wattle walls with tagaram or cadjan roofing seems to be preferred. Advice on design and layout has been consistent with the view that the smoke inlets and outlets should be located at the points necessary to give proper distribution of heat and smoke. Preference has therefore been given, at least for the larger units, to experimental underfloor flues (dual, triple or herringbone) with one or more outlets beneath each rack and adjustable ventilators above the rack. Simpler systems may be quite satisfactory but it is considered that, lacking

detailed experience on simple systems applied to medium or large sized temporary smoke houses, the layouts mentioned above probably offered a greater margin of latitude, flexibility and operating safety. A temporary smoke-house based on these principles has been constructed by Vogan Group, Neboda at Helembe Division and the performance of this unit is now being examined by the Department. If this temporary smoke-house proves to be efficient, the experiments carried out may be summarised in a Quarterly Circular.

A somewhat less expensive, but smaller temporary type smoke-house has been constructed by Rambukkande Group, Ratnapura at Hapurugalla. It seems probable that a number of other units based on this design will be in operation in 1954 and it is hoped that the Department will be able to examine the performance of one of these in detail in 1954.

A number of measurements of the loss of weight of standard process R.S.S. on heating at 70°C in an oven suggested that about 9 hours heating time would probably be adequate for approximate moisture content determinations. Tests, whereby 20 samples of R.S.S. were cut from a single sheet and conditioned to constant weight at a relative humidity of 67% prior to the determination of the moisture content of one half of the samples in the oven and of the other 10 samples in a desiccator over sulphuric acid showed that the desiccator dried samples gave a higher apparent mean moisture content. The difference in means, although under .07%, is significant. A further slight but significant loss in weight takes place when the sulphuric acid dried samples are heated. Since the R.S.S. samples examined are sensitive to changes in % relative humidity (see below), it is not considered that the observations summarised in the previous two sentences render heating in the oven at 70°C unsuitable as a practical method for approximate moisture content determinations of R.S.S. However, when the samples have a high initial moisture content this time of heating appeared unsuitable.

Measurements have been made of the moisture contents at apparent equilibrium, Me, when various samples of R.S.S. are exposed to a range of relative humidities in desiccators at room temperature. Typical figures are given in the table below :—

Estimated % R. H.	*Apparent Me*
33	.07%
67	.58%
81	.94%

At about 93% relative humidity, the appearance of mould was quite rapid and a reliable estimate of Me could not be obtained. The figures confirm that the moisture content of these samples of R.S.S. is very dependent upon the % relative humidity at room temperature, in agreement with the view that loose R.S.S. should be baled and shipped as early as possible and that reasonable ventilation is likely to be desirable in a drying unit, if a tendency to mould growth is to be prevented.

3.3. *Mould on R.S.S.*—Brief reference to this subject is to be found in the Reports for 1951 and 1952, and the subject of the choice of the most suitable fungicide for air-dried and for smoked sheet is still under investigation in various Far East Research Units, including the R.R.I.C. The problem involved is whether the 'classical' sheet fungicide, p.Nitrophenol, is acceptable to the consumer and whether it is, weight for weight or price-wise, the best and most convenient fungicide. Both aspects of this problem have been discussed

recently by one or more correspondents in the India Rubber Journal (1952 **123** 775 ; 1953 **124** 467 ; 1953 **125** 132 *et al*). The data available for Ceylon including that collected in 1953, clearly suggests that weight for weight p. Nitrophenol is the most effective sheet fungicide tested to date. The more extensive data from the R.R.I.M., which has been summarised by A. S. Cook and K. C. Sekar (I. R. J. 1953 **125** 132), suggests that other fungicides can be as effective as p.Nitropenol but either they are poisonous or the amounts required are considerably greater than with p.Nitrophenol.

While it seems that p.Nitrophenol is, to date, the most effective fungicide, the recent views of the consumer on its acceptability do not appear to be so well established. The R.R.I.C. is normally guided in this matter by the London Advisory Committee for Rubber Research (Ceylon & Malaya) and, while the earlier correspondence suggested that no vital objection to the use of p.Nitrophenol sheet manufacture was known, more recent information from the London Advisory Committee suggests that manufacturers do not like p. Nitrophenol in sheet and may sometimes register mild protests. The latter comments were circulated in Ceylon early in 1953. The alternative view that producers may use p.Nitrophenol and risk the slight discolouration, which may be found, has been suggested elsewhere. In order to obtain a decision in this matter, A. S. Cook and K. C. Sekar suggested (I.R.J. 1953 **125** 132) that it would be useful if an organisation representative of the users of sheet rubber would decide whether, in general, the presence of p.Nitrophenol is acceptable in sheet rubber. As far as is known, the R.R.I.M. received no response to this query, although the editorial (?) comment that 'if users would prefer the moulds to the p.Nitrophenol they have only to say so' was included in the same journal (p. 130). The R.R.I.M. now advises (Planters Bull. N. S. No. 8 pp. 107—9) that air dried sheets may be treated with a fungicide such as p.Nitrophenol, even though difficulties may arise if air dried sheet is used for the same purpose as pale crepe. As far as is known, the R.R.I.M. usually discourages the use of p.Nitrophenol in smoked sheets on the grounds that smoking should give enough protection against mould growth. It is perhaps questionable whether producers in Ceylon would be well advised under the present conditions to use p.Nitrophenol without prior reference to the R.S.S. buyers and consumers, partly because the views of the present buyers and consumers are not known and partly because sheet is not packed and shipped under an Estate mark.

Since R.S.S. is sold loose in Ceylon and much of it suffers a considerable period of storage at the hands of R.S.S. dealers, a considerable portion of Packers' incoming R.S.S. often has appreciable evidence of fungal attack. Before packing and shipment much of the visible mould is often removed by a hand scrub, followed by redrying and smoking. With rising labour costs, one Packing House inquired about the practicability of mechanical washing. After correspondence with various engineering companies and the London Advisory Committee, a brush which might be suitable was obtained by the latter Committee on our behalf. This brush is now in the hands of a Colombo Engineering Company which has provisionally agreed to make preliminary tests before considering a multi-brush unit intended, if practicable, to brush both sides of a sheet at once.

Section 4. Blanket and Sole Crepe

4.1. *General*—During the period under review the volume of advisory work in this section has shown a gradual decrease, presumably as a result of the switch-over to R.S.S. or to ammoniated latex production by increasing numbers of sole and blanket crepe producing Estates. The various items of crepe machi-

nery purchased for erection in the factory should be available for experimental purposes as required in 1954.

4.2. *Bleaching by RPA.* 3—The major portion of the work on this subject has been summarised either in the Department's Conference paper or in a recent article in the Quarterly Circulars (Vol. 28 No. 3, 4 pp. 3—12). The views of the R.R.I.M. have recently been summarised in a recent issue of the R.R.I. M's Planters' Bulletin (N.S. No. 10 pp. 7—9). Both of the last two publications emphasise the need to avoid overheating bleached crepe and suggest (or describe experiments which suggest) that excessive exposure to light is undesirable. Work on the most suitable ratio of RPA. 3 to Duponol in the emulsion has not yielded consistent results. Tentatively it is concluded that a ratio of 9 1, as is believed to be employed in Emulsion A Concentrate, might be an additional insurance, but that it is difficult to show, at least in small scale tests at Dartonfield, that a ratio of 20 1, (which is believed to be the usual ratio in commercial practice in Ceylon), is unsuitable. The advice normally given to Estates is to use a ratio of 20 1 unless tests under their conditions (*i.e.* with their water etc.) suggest that a larger proportion of Duponol is required. Further tests with various anticoagulants give results in agreement with the view that sodium sulphite is more suitable, from the viewpoint of the colour of the finished bleached product, than ammonia, particularly when the quantities used exceed the recommendations in the precoagulation circulars.

Recently the importers of the raw material, Messrs. Mackwoods & Co. Ltd. have been advised by the manufacturers of RPA. 3, Messrs. E. I. Du Pont de Nemours, that concentrated RPA. 3 could be offered for distribution. This material contains less kerosene type diluent and an active ingredient concentration of about 82.5% (specification limits 81.0—83.0%) instead of about 36.5%, so that approximately 10 parts of the latter are equivalent in active ingredient content to about 4.42 parts of the former. The importer's provisional estimate of the saving from the use of the concentrate was very approximately of the order of Rs. 0.15 per lb of RPA. 3, that is, say, Rs. 0.15 per 1000 lbs. of rubber bleached. The changeover from RPA. 3 to concentrated RPA.3, if it is to be made at all, will have to be made with care as certain Estates have not been using this chemical for any great length of time, and the use of concentrated RPA.3 in place of the standard material will require a change in either the ratio of the ingredients in the emulsion or of the amount of emulsion employed. Small samples of concentrated RPA.3 have been used without difficulty at Dartonfield.

Limited examples of discoloured RPA. 3 have been reported to the Department and Estates have been advised by the Department and by the importers to inspect and repack their RPA.3 on delivery into well washed, well sealed glass containers, especially if protracted storage is anticipated.

The question of the influence of iron in the factory waters employed for standardisation and milling at crepe factories using bleached latex has been raised during the year, and the presence of iron in factory waters has been suggested as the cause of slight discolouration in bleached crepes. In a number of the cases there appeared to be alternative explanations. An incompleted survey of the literature suggests that iron can be the cause of discolouration in partially putrefied latex, and that excessive iron can lead to tackiness in natural rubber. However the deleterious effect may depend upon the 'state of combination' of the iron in the rubber, although there is a reference which suggests that for optimum ageing properties the iron content should be as low as possible. An attempt to find the critical limit (*vis á vis* discolouration in crepes

made from bleached latex), of inorganic ferrous and ferric iron in standardisation waters has been made by standardising latex at 2 or 2.5 lbs/gallon with control waters, prior to further dilution to 1¼ or 1½ lbs/gallon with waters containing various concentrations of iron. Interpretation of data from such small scale tests is not easy due to the difficulty of supplying uniform milling water and of building up the finished samples to the same thickness. The experiments suggest that removal of a fraction is desirable and that the use of standardisation water containing about 1 part of iron in solution in a million parts of original water (1 p.p.m.) usually has a negligible or almost negligible influence in comparison with the controls. When the standardisation water contains about 50 or more p.p.m. of iron, part or the whole of the finished crepe (made from bleached latex) usually shows some undesirable characteristic, *e.g.* some degree of brown or yellow discolouration or tackiness etc. The results in the intermediate range were not always reproducible and a brown overtone was sometimes (but not invariably) detected. Tentatively it is concluded that small concentrations of iron in stable solution could be relatively harmless, at least from the viewpoint of discolouration but larger concentrations or localised concentrations of iron *e.g.* 'gushes of rust', precipitating iron, may be undesirable.

However, comparison of the iron content of the incoming factory waters with any critical limit obtained from experiments of the above type is not likely to be of value for all conditions, as the iron is not necessarily present in stable homogeneous solution. Further, cases have been found in 1953 where the iron content of the original stream or well water has been of the order of 0.1 to 0.2 parts per million, but after piping and delivery to the standardisation tank this has risen to about 3.0 p.p.m. One suggested procedure, therefore, is to test the 'unknown' standardisation water under conditions approaching normal commercial practice, against water whose characteristics are known. A number of such tests, comparing R.R.I.C. water with outside Estate water at the R.R.I.C. and at the Estate did not show that the outside Estate water was unsuitable. However, it is possible that the colour of the test lots of coagulum may have 'levelled up' during milling. Similar tests wherein part of the experimental lots of coagulum were milled at the R.R.I.C. and part at the Estate concerned were not conclusive, probably as a result of effects arising through transportation of the coagulum. Facilities to run small scale lots of outside Estate waters on the R.R.I.C. crepe mills are now available and it may be possible to carry out tests for interested Estates in due course.

It is possible that useful data on the suitability of Estate waters in this connection might be obtained by an examination of the iron content of the corresponding finished crepes. The information in the literature suggests that the iron content of first quality crepes may be of the order of 30—50 or 60 p.p.m. Only limited numbers of figures have been collected by the Department in 1953, but it has been found that the total iron content of samples from certain Estates producing good quality crepes was in the range 15—28 (usually 15—20) p.p.m. Experimental samples of discoloured or discolouring crepes showed figures of 155 and 90 p.p.m. respectively. Further attention may be given to this subject at a later date.

Consideration has also been given to the methods available for the reduction of the total iron content of natural waters. According to the literature iron, present in natural waters in its most commonly occurring form, may be removed by oxidation (aeration) followed by filtration with or without prior settling depending upon the conditions. Artificial aeration can be accomplished by spraying through nozzles or by 'splash aeration'. The former

is believed to be more efficient but the latter can be improved by allowing the water to fall over a 'weir' onto broken stone or coke. A large scale unit, involving, in effect, a coke aerator and a sand on metal (or rubble) filter has been built by Messrs. The Colombo Commercial Company for an Estate in the Ratnapura district. Analysis of samples drawn from the original stream water and from the final effluent of this unit in April and again in July suggest that this unit can reduce the total iron content of the water from about 1.1 and 1.5 p.p.m. to about .21 and .12 p.p.m. respectively, and may also reduce the total solids in the water. While the unit is of large capacity and expensive, the Estate concerned appeared to consider the expenditure worthwhile on a long term basis. Further inquiries on the unit should be referred to the construction engineers or to the Estate concerned.

According to the literature the oxidation and thence the removal of iron in certain natural waters is assisted by the deposit of previously oxidised iron on the filtering material. A small scale (40 gallon oil drum), inexpensive unit which appears to utilise this principle has been described in a circular issued by Messrs. Mackwoods Ltd. on 14.11.52 and entitled 'Water Filter for Rubber Manufacture'. The unit is intended primarily for the production of standardisation water at the rate of about 20 gallons per hour and was probably first set up at Palmgarden Group, Ratnapura. The unit at Palmgarden and one constructed at the R.R.I.C. have both been examined in some detail under normal operating conditions and the iron content of the effluent has invariably been found to be considerably less than that of the untreated water.

4.3. *Lamination of Sole Crepe Laces*—This investigation into the cause of the difficulty observed in the lamination of sole crepe laces at certain Estates, principally in the Matale district has continued in 1953. As mentioned in the Report for 1952, it has been pointed out elsewhere that it is difficult to see how small quantities of calcium etc. in milling water could interfere with the lamination when the proportion of calcium in the original latex is not negligible. For this reason a large part of the earlier work on this subject has been repeated by different operators. At present the basic conclusions, that the quality of the milling water used on the last smooth mill is important, seems to be substantially correct.

pH determinations have been made on milling water samples obtained from a large number of crepe producing Estates. The relationship between pH of the milling water and the ease of lamination in the absence of a hot table is not clear-cut and it does not appear to be possible to give concise critical pH limits outside which lamination is readily accomplished, even in the absence of a hot table. It was noted, however, that the pH values of the water samples selected from Estates where lamination is difficult are often, but not invariably, amongst the highest figures recorded. The pH of R.R.I.C. factory water was determined daily over the period that outside Estate sampling took place and the value obtained was invariably under 6.5. The various lace soaking experiments, whereby R.R.I.C. crepe laces are soaked for varying periods of time in dilute solutions of certain chemicals prior to drying and lamination, have been repeated. Partial analysis of further samples of the milling water used at Estates in the Matale district, where lamination is difficult, confirmed the presence of a relatively high proportion of Calcium and often of Magnesium.

A number of small scale ion exchange columns, using Permutit Co. materials, have been set up to remove the major portion of the calcium from the milling water samples selected at the above Estates. Small scale lace soaking experiments carried out at the R.R.I.C. with these treated waters suggest that

adequate lamination could probably be obtained by using these partially demineralised milling waters on the nip of the last smooth mill. This conclusion has been confirmed, at least under certain conditions, by setting up the apparatus at one of the above Estates and treating about 50 gallons of milling water which was used on the last smooth mill. The Superintendent concerned reported that the sample laces (prepared with treated water and) laminated (without a hot table) were more satisfactory than standard process samples. Demineralisation of part of the milling water is not at present expected to be very attractive commercially in Ceylon, partly due to the decline in sole crepe prices and partly due to the fact that the increase in colour found by using a hot table for lamination appears in many cases to have been largely offset by the general improvement in lace colour obtained as a result of the careful use of R.P.A. 3.

4.4. *Mould on Crepe*—The Report for 1952 p. 16 contains the statement 'Since the optimum conditions for mould growth seem to include high water vapour content in or near the samples, an investigation on the suppression of mould requires, for example, consideration of the means of ensuring a reasonably low overall moisture content on leaving the factory and perhaps the incorporation of a non-deleterious fungicide, added primarily to protect the material against mould as a result of exposure to conditions favourable to mould growth after leaving the Estate'. In view of the difficulties which must be expected before a highly efficient, non-deleterious fungicide is likely to be found and of the objections that blanket crepe users in particular are likely to make to the addition of chemicals to their raw material, it should be apparent (1) that Estates should at all times take steps to ensure that their drying facilities are suitable and of adequate capacity and (2) that Packers and Shippers should ensure that the crepe is kept as dry as possible.

Experiments involving the incorporation of varying concentrations of imported fungicides have continued in 1953. The procedure normally employed is to add the fungicide, with dispersing or emulsifying agents, as required, to the latex before addition of the acid. The resulting coagulum is milled and finished as sole crepe. A subsample of this sole crepe is stored in a desiccator over water and in two other places using as controls samples made from latex containing 0%, .1% and 1% of p.nitrophenol on the dry rubber. The fungicides tested are mostly proprietary materials rather than pure compounds and included Vancide 89 AW, Crag 974, Phygon XL, Spergon, Milban D, IN 2555, various Dithanes, Dichlorophene and various organo-mercury compounds specially imported by Messrs. A. Baur & Co. Earlier tests included Vulcastab D.D.M., Shirlan and other materials. When the test samples are exposed in the desiccator under our conditions, none of the fungicides appeared to be as efficient at a concentration of .1% on the d.r.c as .1% p.nitrophenol, although some but not all at a concentration of 1% appeared about as efficient in fungicidal properties as .1% p.nitrophenol. The information relating to the comparison against 1% p.nitrophenol is not available on all cases. In general these imported fungicides are tested at 3 to 5 concentrations in the range of .01% to 2.5% on the d.r.c. Since the moisture content of the test pieces tends to increase under the test conditions, it must be concluded that, in general, these fungicides are not likely to be very satisfactory when used in low concentrations under conditions favourable to mould growth. The incorporation of larger concentrations in blanket crepe cannot be expected to be well received by the consumer, at least for the present, and the incorporation of large concentrations in sole crepe often has an adverse influence on the colour. A summary of some of the literature on these chemicals is available for inspection at the R.R.I.C.

4.5. *Drying of Laces*—Pending the operation in 1954 of the C.C.C. direct fired oil burner connected to the smoke-house and drying chamber, further small scale experiments have been carried out in 1953 as a continuation of the work mentioned in the Report for 1952 (pp. 19—20). There are references to some of this work in the introductory talk given at the Conference in November 1953. The relation between the % relative humidity in closed vessels at room temperature and (1) Me, the moisture content at apparent equilibrium, and (2) the time taken by wet laces to arrive at a moisture content near to Me has been investigated. For sole crepe laces under the conditions employed, Me appears to be less dependent than standard process R.S.S. upon the initial % relative humidity, unless the latter is very high. Further, the time taken for the wet laces to reach a moisture content near to Me did not appear to be independent of the initial % relative humidity. However, since the experimental conditions employed are not identical to those of present day commercial practice, any generalisations or deductions made on the basis of these observations will have to be checked in commercial type equipment and it is hoped to start this work in 1954. At the same time the effect of controlled dialysis of coagulum upon the time of drying will be investigated in tests made on a rather larger scale than those carried out in 1952 and 1953.

Approximate determinations of the moisture content of laces are made by heating the laces for 6—8 hours at 70°C and this procedure seems quite suitable for laces whose thickness is equivalent upto 72 gms sq. foot and whose initial moisture content is upto 5%, and could probably be employed for 'wetter', thicker laces. Tests where 20 samples are preconditioned at 81% relative humidity prior to determination of the moisture content of half of the samples by drying in the oven and of the other half by drying over sulphuric acid, failed to show significant differences between the mean figures. Heating the desiccator dried samples results in a further slight loss in weight which is significant at P=.05, but not at P=.02. The standard deviation of the moisture content of the 20 samples conditioned at 81% relative humidity was .04% When finished sole crepe is tested the time of heating has to be adjusted according to the thickness, but tests carried out in the manner described above suggest that the procedure is suitable for approximate purposes with freshly prepared crepes.

The Report for 1952 briefly discussed the subject of the maximum permissible moisture content of dry laces, and in the preceding subsection of this report it has been noted that a low overall moisture content is necessary if fungal staining is to be avoided. Specification of an upper limit (and of a standard deviation) of the moisture content is likely to be difficult and it may be more practical to acquire data giving typical figures at Estates where defects such as fungal staining, poor appearance after lamination etc. are more or less unknown. Figures of this nature may enable the R.R.I.C. to carry out proper comparisons of various drying units and systems. Certain preliminary investigations have been carried out and it has been confirmed that the time of day when the samples are drawn and weighed is important, particularly for laces dried in a loft. Laces sampled early in the day usually tend to show significantly higher moisture contents than those sampled at or slightly later than 11—12 (noon) and as is well known, laces taken from the loft early in the morning and laminated without further drying often show characteristic visual defects. There is also evidence of a significant variation between and within laces for 'loft-dried' laces sampled at one particular time. The variation within laces is due at least in part to a significant difference between samples drawn near the reaper and those drawn near the lower end of the lace. These differences were significant even when the overall moisture content of the lace was between .2 and

.3%. It is not clear whether this difference is due to surface drainage of a residuum of the moisture picked up during the night nor is it clear whether such an effect could be anticipated in laces dried in a tower.

Section 5. Compounded Rubber — Technical Classification

5.1. *Equipment, General*—During the period under review the D.C. operated Mooney Viscometer, built up specially by the London Advisory Committee, has been delivered, erected, calibrated and set into use. The constant temperature room has been set up and is in working order. The space in the main factory building allocated to the Chemical Department has now been vacated by the Estate Department. A second Bridge mixing and sheeting mill has been delivered, but the relatively minor damage incurred by the mill during transit from the U.K. has not yet been repaired.

A summary of certain aspects of this subject, primarily with reference to Ceylon, may be found in the appropriate 1953 Conference paper. Various other documents on this subject have been circulated by the Department during the year. Examination of the literature shows that the annual world production of T.C.R. continues to rise and during 1953 Indonesian interests have commenced placing relatively large volumes of T.C.R. on the market. The problem of misclassification of border-line consignments of T.C.R. has been considered on an international basis and the class limits of the vulcanisation characteristic are to be amended with effect from the commencement of January 1954. These new class limits as notified to R.R.I.C. are shown below in terms of strain values :—

Technical Classification Colour	*Consumers' Acceptance Limits*	*Producers' Marking Limits*
Red	79—103	85—103
Yellow	67— 91	73— 85
Blue	55— 79	55— 73

These new limits adopted by the International Rubber Research Board are expected to be acceptable to the consumer as they contain certain desirable or novel ideas. Firstly, the imposition of an upper limit to the red class and of a revised lower limit to the blue class is obviously intended to cause the exclusion of special or 'abnormal' rubbers from the basic system of classification. Secondly, the reduction of the width of producers' marking limits for the yellow class from 24 to 12 strain units would be expected to decrease the variability between the means of individual production lots of yellow T.C.R., and, if, in addition, the consumers' acceptance limits are fairly rigidly enforced as limits for bales, *i.e.* if only a low % (statistical) misclassification is permitted, then the variability between and within individual consignments (groups of individual production lots) of yellow T.C.R. will be expected to be decreased in comparison with earlier performance.

As noted in the report for 1952, the Mooney Viscosity processability characteristic has been dropped from the scheme of classification. No alternative test has been proposed and accepted.

5.2 *Procedure Experiments* (*T. C.—A.*1 *to T.C.—A.* 17)—The approved policy of the Department is that it shall be able to provide training and advisory facilities at comparatively short notice for those wishing to take up the subject

of technical classification on a large scale and not that it shall undertake actual commercial classification (or at least not for the present). The Department has had to start virtually from scratch with new equipment, with personnel substantially unfamiliar with the requirements of experimental work on this subject and with strictly limited numbers of Assistant and Minor staff. All the early experiments had of necessity to be carried out without control in the form of compound Mooney Viscosity measurements, as the instrument was not available as early as expected.

B. S. 1674 : 1951 p.10 states that, for convenience, mixing may be carried out using masterbatches or blends in the required proportions of some or all of the powders and adds a footnote to the effect that some workers find these procedures lead to more reproducible results. The R.R.I.M. suggest the use of masterbatches, but certain workers in Indonesia prefer to use powder blends. The Department's early experiments with masterbatches were unsatisfactory, as the compound seemed too sticky and fluid for easy handling and the powder tended to be lost too easily. To a lesser extent this still applies and masterbatches are still not easy to handle, although this is perhaps due to unfamiliarity with the method. As an alternative, a Griffin and Tatlock vibrating ball mill has been employed initially without pebbles (T.C.—A.1) as a high speed vibratory mixer and blender. More detailed tests (T.C.—A.3) with times of ball milling ranging from 10 to 60 minutes showed substantial and significant differences between the times of ball milling. Later tests (T.C.– A.8, T.C.– A.8 (*b*) etc.) appeared tobe in agreement with the view that powders could be advantageously ball milled with only a limited number of pebbles, that our stearic acid is better added separately (*i.e.* omitted from the blend), and that the ball milling could be advantageously stopped at least once or better twice to remove all the material caked on the walls and on the pebbles. While the data suggested (T.C.—A.8, (b)) that the main bulk of the powders are adequately blended in quite a short space of time, the material caked on the walls and pebbles is not adequately blended on the basis of visual inspection unless removed according to the schedule.

An early experiment (T.C.—A.9) suggested that drying the powders before blending did not give significantly different strain values, possibly because the powders had not been in stores for a protracted period and possibly because the heat generated during ball milling may serve partially to condition the powders to humidity. An elaborate experiment (T.C.—A.17) using dried and homogenised chemicals to obtain an estimate of the errors arising during blending showed that the differences in final strain values attributable to variations between powder blends of previously dried and separately homogenised sulphur, m.b.t. and zinc oxide are extremely small. However, the importance of variations between batches of the individual chemicals used has been mentioned in the literature, particular emphasis being placed by the I.R.C.I. on the variability between batches of zinc oxide. N.B.S. standard samples of zinc oxide have only recently been obtained (on loan from the R.R.I.M. pending deliveries from the U.S.A.) for check tests against our batches of zinc oxide. The latter have not been found to be defective, but any difficulties of this nature would have been eliminated within a single experiment by an elaborate system of cross-blending the powder blends. The importance of controlled mixing conditions is emphasised in the literature, and the mixing conditions have to be controlled to arrive at an average compound Mooney Viscosity figure of 40. At present the compound Mooney Viscosity of all experimental mixes is now determined and the appropriate correction applied to the observed strain value. Before the Mooney was in operation errors from this source were minimised as far as possible by using a controlled mixing cycle and by

carrying out the mixing in duplicate or triplicate. The latter procedure has of course meant that the exact 'level' of the data was not known. In the early experiments the standard deviation between mixes of the same batch of rubber and powder blends approached as much as 2.5 strain units, but in later tests the corresponding figure has been in the region of .5 strain units. Tests carried out to determine whether there is a significant 'between days' effect as noted in London suggested (T.C.—A.17) that this effect can at times be significant. The reason for this is not clear.

In the case of curing and testing errors, early experiments gave unduly high figures for the standard deviations between cures and between test pieces within cures. Later experiments (T.C.—A.13) suggested that both those values could be considerably decreased by more careful loading of the compounded rubber into the mould before vulcanisation *i.e.* by careful and rather protracted pressing of the compounded rubber into the cavity. At the same time this 'hand' pressing reduced the mean strain of low modulus rubbers. A significant difference between times of day for testing was also found (T.C.—A.7), and, pending the completion of the construction of the constant temperature room, a large size thermostatically controlled refrigerator containing trays of ammonium sulphate was employed for conditioning purposes. At present the mix-cure test error variance is of the order of 1 strain unit. A limited number of tests have been made with the rapid test procedure suggested by the R.R.I.M.; this is referred to in C.P. 1769 p.13 para 4, but further work is in hand.

5.3 *Technical Classification of Ceylon's R.S.S.*—As mentioned briefly in the preceding subsection, the basic policy is that the Department shall carry out such small and large scale experiments as may seem necessary or useful in order that the Department shall be able to offer advice to Government and to the Planting Industry as a whole at such time that the production of technically classified R.S.S. is decided upon in Ceylon, or whenever such advice is required. The situation in Ceylon is not at present identical to that in Malaya as little or no rubber, other than sole crepe, is packed or shipped except by specialist Packing Companies in Colombo or Galle and as far as we are aware all R.S.S. is sold loose by the producers.

The procedure suggested to classify Ceylon's R.S.S. will depend *inter alia* upon the international policy in respect of the definition of technically classified rubber, the relative demand for each class of technically classified rubber and upon the size of the outturn of each R.M.A. grade from the producing or packing concerns involved. In principle the procedure adopted will probably include one or more of the schemes summarised below :—

(*a*) No T.C. grading of producers' outturn ; complete blending across and/or within producers' outturn, as required, by the Packers.

(*b*) Approximate T.C. grading of certain producers' outturn, where the R.S.S. might be blended (scrambled) within invoices ; selected invoices from different sources being blended by the Packers according to the approximate T.C. grading and to the consumers' requirements.

(*c*) Carefully controlled production by certain producers to give restricted variation in technical classification properties between and within invoices or days ; restricted or no blending across different producers invoices with baling by the producer or by the Packers.

Under present market conditions in Ceylon it is to be anticipated that scheme (*a*) will be attractive for all small Estates and Small-holders' R.S.S. and for the lower quality R.M.A. grades. Under certain conditons, as explained elsewhere by the Department, scheme (*b*) could be attractive to both the larger Estates and to Packers. Scheme (*c*) with baling on the Estate is that operated in Malaya for large Estates' R.S.S. and might eventually prove attractive to the largest Ceylon Estates. Obviously, the work of the Department on this subject must be considered in the light of these three schemes and it is necessary to examine the implications—at this stage the technical rather than the political or financial implications—of these schemes to the Department.

The successful operation of scheme (*a*) presupposes that adequate information is available to show (1) approximately what proportion of Ceylon's R.S.S. has a strain value outside the limits 55 to 103 with, if practicable, details which will show whether these 'abnormal' sheets can be adequately blended with other R.S.S. and (2) whether additional blending, *i.e.* blending beyond that usually carried out in standard practice, would be necessary. Regarding the distribution of strain values of R.S.S., various experiments, mentioned below, are either in hand or completed and can give at least some reliable information on this subject.

Experiment No.	*Source of Sheets*	*No. of individual sheets sampled in* 1953
T.C.—C.2(*a*)	Packers stocks of 1, 2, 3, 4	128
T.C.—C.3(*a*)	Packers stocks of 2	90
T.C.—B.3,4	1 Large Estate, sampled 4—8 days per month	320
T.C.—B.6	Small Estates	25
T.C.—B.7	Large Estates	180
T.C.—D.1	Smallholders	240
T.C.—D.3	Smallholders Cooperatives	31

The information at present available suggests that only a small proportion of the sampled R.S.S. will fall outside the above strain value limits. A number of these experiments are to be repeated in 1954 to obtain information on the seasonal changes, if any, in the distribution of strain values of the R.S.S. Some of the experiments will be made using random samples selected from Packers' stocks, and some using sheets selected from the large Estates, Smallholders Cooperatives and Smallholders, whose output was sampled in 1953. Regarding the subject of the degree of blending achieved by Packers in the usual 'rotational packing' procedure, preliminary tests (T.C.—C.1) mentioned in the Report for 1952 suggested that the variation between bales within grades was smaller than expected. Statistical analysis of the figures obtained from a more detailed test (T.C.—C.2) carried out in 1953 in two distinct parts on the basis of 6 bales per R.M.A. grade (1 to 4) per day showed that the standard deviation (in strain units) between bale samples within grades and within days could vary from as little as 1 to over 7. About 2/3 of the lots of 6 bales showed a standard deviation between bale samples of 5 or less in strain units. The mean strain value for each R.M.A. grade was near 80, that is near the centre of the yellow class. The strain values of all the bale samples fell within the limits 64—92. From this experiment it is tentatively concluded that, while consignments of R.S.S. bales made by rotational packing of Dealers' R.S.S. may well give mean strain values within the producers' marking limits for yellow T.C.R., further blending would appear to be necessary if it is intended

that a very high proportion of the consignments should be sold as technically classified rubber. The analysis of the figures suggest that the variance due to between bales is larger than that between days which is larger than that due to between grades, and it seems possible that the main source of variability, with respect to bales made from Dealers lots of R.S.S. in Ceylon, may be within rather than between Dealers lots. [In the case of the R.S.S. produced by large Estates, the main source of variability is usually between rather than within Estates.] Various blending experiments (T.C.—C.3) using R.M.A. 2 bales loaned by a Packer, are in progress at the R.R.I.C. Since the Packer concerned is rather short of space, the bales are transported to Dartonfield for examination and repacking according to fixed procedures.

Under schemes (*b*) and (*c*) of the classification system only limited or no blending across certain Estates' invoices would be permitted by the Packers, and the successful operation of these schemes would require the Packers to know the mean position and approximate distribution of the strain values of the sheets or bales comprising the invoices from these Estates. A limited number of the larger R.S.S. producing Estates have supplied samples of their R.S.S. following a fixed sampling procedure (T.C.—B.7), and it is hoped that this experiment will be continued in 1954. One Estate has had its output sampled (T.C.—B. 3,4) on 4 to 8 days (usually consecutive days) per month for 6 months of 1953, and in the later samplings the test samples have been selected from 2% of the sheets rather than on the basis of corner samples of 50% of the sheets making up hypothetical bales. Some of the relevant data for Estate V is summarised below :—

Date of Sampling	Mean Strain	Standard Devn. of daily Mean	Standard Devn. between sheets	No. of Days of Sampling
April '53	67.0%	1.2%	—	6
July '53	68.2%	2.2%	3.3%	8
Sept. '53	67.3%	1.3%	2.6%	4
Oct. '53	68.7%	1.6%	3.3%	4

While the test has not yet covered a wintering period it appears that the R.S.S from this Estate could be technically classified at least for many months of the year and it is hoped that, if experimental lots of techinically classified rubber are to be exported, the R.S.S. from this Estate and from some of these covered by experiment No. T. C.—B.7 would be available for immediate classification.

The strain value limits for the 3 technical classification classes effective from the beginning of 1954 largely eliminate the need to consider 'level-changing' techniques, at least from the 'border-line' viewpoint. However it may still be desirable for other reasons to consider simple means of changing the level of the mean strain of an Estate's R.S.S. and much attention has recently been given to this subject outside Ceylon. The Department hopes to consider this subject in more detail in 1954, when the smoke-house at Dartonfield is in proper working order.

5. 4. *Technical Classification of Ceylon's Latex Blanket Crepe*—As noted in the Report for 1952, Dr. R. G. Newton suggested that Ceylon's output of latex blanket crepe might lend itself to technical classification on a commercial scale. For various reasons no progress could be made in this subject until 1953 when a questionnaire was despatched to Estates through Agency Houses to obtain certain statistical data. From a consideration of the replies it appeared

that for the Estates concerned the major portion of Ceylon's latex blanket crepe in July—August 1953 would be derived either from sole crepe trimmings or from the first fraction taken during the course of sole crepe manufacture, and that the major portion of the Estates which used to convert all or almost all their latex into latex blanket crepe had turned or proposed to turn their production to sole crepe, sheet or to ammoniated latex. Since there is evidence from the early and recent literature to suggest that the mean strain value of first fraction might be considerably less than that obtained with trimmings, an experiment (T.C.—B.5) was carried out using samples from 11 crepe producing Estates to obtain numerical data on this point. The sampling was carried out by the Estates concerned and the first fraction laces were sampled, before being blanketted, by a procedure analogous to the Sumatran 'trough' method.

The table below (in strain units) refers to the mean figures obtained for 8 Estates supplying one or more samples of first fraction with one or more samples of (usually 3rd) trimmings.

	1st Fraction	*Trimmings*
Overall Mean ($\overline{X}$)	62.1	99.0
Standard Deviation of Estate means	10.6	12.3

The individual figures making up the means clearly suggest that a large proportion of first fraction crepe would be expected to fall within or below the limits of the blue class and that a large proportion of the trimmings crepe would be expected to fall within or above the limits for the red class. For the purpose of producing consignments of crepes with a high degree of uniformity within as well as between bales, it would appear desirable to ensure that first fraction and trimmings crepe be kept separate by the producer. This may well be of greater importance than the separation of lots from different producers.

Section 6. Miscellaneous

6.1. *Disposal of Factory Effluents*—This subject is mentioned briefly in the Report for 1952 where it has been pointed out that a limited number of Estates, (at that time crepe producing Estates), requested the R.R.I.C. to advise them how to prevent their factory effluent giving rise to offensive odours. The problem was particularly acute in the case of at least one Estate, whose main factory is located within the urban limits of a town in Western Province and whose drainage ditch is liable to become almost, if not entirely, stagnant during the dry seasons. Little work could be carried out on this subject in 1952 due to the absence of a suitably qualified officer and of sufficient technical literature on the subject. In 1953, the present Research Assistant, Mr. M. Nadarajah, has been able to devote a considerable portion of his time to this subject.

Solution of the problem of the cheap, 'nuisance-free' disposal of raw rubber factory effluents may depend upon the proportion of dispersed rubber in the effluent as well as upon the volume of water available for dilution purposes, and it may be necessary to consider in due course, three separate systems, *e.g.* latex serum containing little or no dispersed rubber, serum containing appreciable but not large amounts of dispersed rubber and serum containing large amounts of dispersed rubber. At present, our investigations have been confined to the system where the proportion of dispersed rubber is normally very small, *e.g.* properly coagulated crepe or R.S.S. serum suitably diluted, as this is of greatest interest in Ceylon. In theory, serum is not stable indefinitely unless specially treated and it would be expected that, under the appropriate

conditions, partial or complete decomposition could be arranged to take place either aerobically (in the presence of air) or anaerobically or by a suitable combination of both processes arranged to operate 'in series'.

The preferred commercial procedure for effluent disposal, as far as is known, is to discharge through a suitable drainage ditch into the nearest stream. While this method can, under the appropriate conditions, be satisfactory from the viewpoint of the production of no 'noticeable' offensive odours, it's suitability from the viewpoint of pollution of waters used for domestic purposes may be questionable and depends upon the individual conditions involved, and, in particular, upon how quickly the degraded stream reverts to its original status in relation to the points where it is used for domestic purposes. As a long term policy for Estates, it seems undesirable to conclude that such unrestricted use of waterways for effluent purification will be permitted indefinitely in Ceylon in all cases. Accordingly a detailed programme of investigation has been put in hand by the Department to obtain information on the anaerobic and aerobic decomposition of diluted and undiluted fresh serum, usually crepe coagulum serum.

While the Dept. has been advised that the more active microorganism in serum are likely to be facultative anaerobes, the anaerobic decomposition of serum if carried to completion could have the attraction that the bi-product methane might be suitable for use in drying plants. Early experiments showed that serum could usually be stored in corked vessels (nearly full) out of sunlight for about 1 week, without the production of offensive odours. Deaeration of such solutions by bubbling nitrogen through the concentrated serum appeared to fail to start any anaerobic action, as estimated by a lack of gas evolution and of blackening of the solution. Experiments with serum in clean acid carboys suggested that the addition of quite large amounts of cowdung with a little alkali (lime or washing soda to a pH of about 6 to 7) seemed advantageous, if not essential, for starting the anaerobic reaction.

An anaerobic pilot plant has been built following the suggestions of the Water Pollution Board's Research Laboratories at Watford, U.K. The unit is basically a 40 gallon drum mounted on its end. The drum has a number of sampling tubes at different heights, with provision for entry of fresh serum at the lower end and separate gas and liquid outlets at the top. The unit is now gravity fed continuously. A small paddle-type stirrer is in operation near the lower end of the drum. This stirrer is directly coupled through a gas-proof seal to a D.C. motor operated almost continuously, and is designed to agitate the sludge very gently and not to mix the contents of the drum. The stirrer speed is controlled by a hand operated resistance, and without very careful attention by the labour the desired slow speed is not readily obtained and mixing of fresh serum with outgoing liquid is probably found. To some extent the effect of this may be overcome by prolonged storage of the anaerobic stage effluents in the drums and cylindrical vessels used for settling. In 1954, it is hoped to build and set into operation a second small scale anaerobic unit, equipped with reduction gearing in the stirring mechanism, so that slow speed sludge agitation rather than stirring can be carried out.

The anaerobic unit was started by the addition of cowdung (equivalent to about 10% of the volume of the unit) followed by water. The serum concentration was built up by the daily addition of 4 to 8 gallons of limed serum. Evidence of gas evolution was not obtained before about a week. At this stage the addition of lime ceased. This anaerobic unit has been in operation at least 7 months and is fed with about 8 gallons of substantially undiluted

serum per day. This volume, (which corresponds to a theoretical retention period of about 5 days), may not be the optimum, but excessive daily additions of raw serum would be expected to produce high concentrations of intermediate organic acids which are toxic to the microorganisms involved. Addition of alkalis would not be expected to permit an increase in the daily 'output'. Determinations of the oxygen demand from potassium permanganate suggest that the figure for the settled anaerobic stage effluent is about 10—25% of that of the original serum. 5 day biological oxygen demand figures will be available later. The effluent is not considered suitable for discharge, at least not without much dilution.

Further treatment of the above effluent, after dilution with twice its own volume of water, is carried out on 3 small percolating filters usually operating in series. These percolating filters are columns of 'road metal', through which the diluted effluent is slowly dripped at a fixed rate. The operation of these filters is intermittent (4 minutes' dripping, 4 minutes' draining). These biological aerobic filters are 'started' with cowdung and the concentration of their raw material gradually built up over a period of at least one month. It is not yet certain whether these units are operating under optimum conditions. The present final effluent, after correction for dilution during process, appears to have an oxygen demand which is about 3 to 7% of that of the original serum. Pending the arrival of the chemicals necessary for 5 day biological oxygen demand tests, the final effluents have been tested biologically for their effect on local stream-fish using the effluents in small scale aquaria. None of the local stream-fish failed to survive at least 14 days when kept in final effluent diluted with a total of only 4 times its own volume of water.

Subject to further confirmation (and these tests should only be regarded as being of a preliminary nature), it is concluded that raw substantially unammoniated and undiluted serum, containing only small amounts of dispersed rubber could probably be treated firstly, by an anaerobic and then by an aerobic process to produce a final effluent which could probably be discharged with reasonable safety into streams (without excessive dilution). Various experiments involving alternative anaerobic units and wholly aerobic systems are also in progress, and it is not intended to imply that the treatment mentioned in the preceding sentence is necessarily the most suitable.

6.2 *Copper Content of Ceylon Rubber*—The Rubber Manufacturers Association Inc's 1952 Type Descriptions contain a clause defining the upper limits of copper and manganese and, as no recent data showing the copper content of Ceylon rubber is available at the R.R.I.C., a small scale survey of the copper content of Ceylon crepe and R.S.S. has been put in hand. This work is not yet completed.

REPORT OF THE BOTANY DEPARTMENT FOR THE YEAR 1953

By

C. A. De SILVA

SUMMARY

Plant Breeding

The Botany Department is mainly concerned with plant breeding work. Hand pollination work was carried out from 1939 to 1945 with the exception of 1942. With the appointment of a plant breeding officer in 1953, a small scale hand pollination programme was completed during the flowering season.

A total of approximately 5000 hand pollinated seeds were planted out on 9 outside estates and in the substations at Nivitigalakele and Hedigalla from 1941 to 1947. From a study of the most promising seedling families, of the earlier crosses now in tapping, the local clones MK3/2, WG. 6278 RLD8, and HC28 have shown themselves to be reliable seed parents. Clones TJ.1 and TJ.16 are already known as good seed parents and have crossed well with these local clones. Although illegitimate seed of clone PB86 has not been tested on a commercial scale in Ceylon, legitimate seedling families of this clone are giving promising results in the first year of tapping.

Five tree clones have been established from the greater proportion of the hand pollinated seedlings planted out and these have been planted simultaneously with the seedlings in adjacent clearings. The most promising clones from seedling families of the earlier crosses between local clones are giving 14 to 19 pounds of dry rubber per tree per year in the sixth tapping year. Clones established from later crosses, especially with foreign clones like TJ.1, PR.107 and PB86 have yielded 13 to 18 pounds dry rubber per tree per year in the third tapping year. Clones established from crosses of clone PB86 and local clones have yielded 6 to 8 lbs. per tree per year in the first year of tapping, equivalent to about 29 grams and over per tree per tapping as shown in table XIIIB in this report.

Performance of local NAB clones

Clones NAB 12, 15 and 20 are the most promising in this series which were established from selected high yielding Tjikadoe seedlings in 1939 after 9 years of test-tapping.

Foreign Clones

Trials of the more recently introduced foreign clones show that clones AV255, PR107, RRI-501, 513, LUN.N, PB5/60, LCB1320 are the better yielding types under the climatic conditions in Ceylon. A number of new Prang Besar clones, Chaemara clones, and clones IRCI 7, IRCI 10 and OY 1 from Indo-China have been planted out in recent clearings for trial under local conditions.

Clonal Seedlings and Budded Rubber

The experiment at Dartonfield indicates that high stands of clonal seedlings selectively thinned out on early tapping results can give yields, which compare favourably with TJ.1 budded material. Illegitimate seedlings of clone PB86 are still not up to the standard of the other clonal seedlings in this area, which include "selfed" seedlings of clone TJ.1. There is a significant correlation of .6911. between the early yields of the Morris-Mann system of tapping and those of the mature rubber in the second year of tapping.

GENERAL INVESTIGATION

Investigations on Budgrafting

1. An experiment to test budgrafts established from main-stem buds and branch-buds has shown seedling characteristics, especially the corky bark and somewhat conical growth, in the budgrafts from main-stem buds in the early years of growth. Yield results in the first two tapping years have shown no significant differences between the two types of budgrafts.

2. Two series of budgrafts of clone MK3/2 from branch-buds taken from the highest and lowest yielding trees of the original 52 budgrafts of this clone have shown equivalent average growth and yield, indicating that environment and variability of stocks have no effect on the inherent genetic characteristics of the clone.

Crown Budding

The crown-budding experiment planted in 1945 shows that crown-budding in the fourth year of growth has given a set-back of about 2½ years growth to the 8 year old crown-budded centre sections. The growth results show that the centre-sections crown-budded with the heavy crowns have grown better than those crown-budded with clones with sparse foliage. Other experiments show that crown-budding is ideally carried out at about 2 years of age ,when there is sufficient brown bark for crown budding at a height of approximately 8 feet. Crown-budding at heights of 5′ and 8′ show no significant differences in growth.

''Hedge'' planting

31 clones planted 6′×45′ in 1949 have shown normal growth of the main stems after 4½ years growth on hilly exposed land at Hedigalla. The average girth is 12.6 inches. No cases of wind damage have been reported.

NEW PLANTING IN 1953

Clone Trial

A large scale clone trial of 96½ acres was planted in Hedigalla with replicated plots of 200 trees for each of 14 clones. The R.R.I.C. clones RLD2 to 7 have been included. These clones were established from PBIG seedlings in 1935. Five of these clones have given very promising yields in the first 7 months of tapping in the 1945 clone trial at Hedigalla.

Seed Garden

A seed garden of 14½ acres was planted at Hedigalla with 8 selected clones as seed bearers and other reliable clone parents which do not set much seed under local conditions, on a smaller scale as male parents.

Tapping

Preliminary arrangements have been made for the tapping of R.R.I.C. legitimate seedlings and derived clones on 9 outside estates. There are 11 trial plots with 600 trees in each.

24 trees of clone LCB.870, the Oidium resistant clone, planted in Matale in 1941 were test-tapped under the supervision of the Botanical Department in 1953. The indications are that the clone can be expected to yield 600 lbs. per acre per year of dry rubber with 150 tappable trees. Preliminary tapping of 4 trees at Dartonfield indicates that the clone can be expected to give yields of a higher order in the wet low country districts.

Trial with Rainguards

Two years of tapping with rainguards compared with comparable unguarded area, have shown that the increased yields from trees with rainguards are of a much lower order than those reported from some estates. In this particular experiment earlier tapping after wet weather of trees with rainguards was the only advantage. After rainstorms both guarded and unguarded panels were equally unfavourable for producing economical returns from tapping.

Importation of New Planting Material

Seedlings established in Malaya from seed of Hevea brasiliensis and Hevea benthemiana from Brazil and Peru, originally imported by the Rubber Research Institute of Malaya, have been successfully established as clones at Dartonfield. The stumps were shipped to Ceylon in June, 1953, by courtesy of the R.R.I.M. This material will be used for breeding work.

Hand Pollination Programme 1953

2252 seedlings have been successfully established in nurseries at Dartonfield from hand pollinations carried out in 1953. A number of high yielding local clones established in recent years have been introduced into this pollination programme including a few crosses representing ''sibs'' and half ''sibs''.

Staff—The Botanist, Mr. C. A. de Silva was on duty throughout the year.

Mr. L. Wijeyegunewardene assumed duties on 1st January, 1953, as Plant Breeder. He was on duty throughout the year and carried out a pollination programme during the flowering season in 1953. During the second half-year he has been supervising the tapping of legitimate clonal seedlings and derived clones on nine outside estate field trials.

A selection was made from a number of applicants for the post of Research Assistant to the Botanist in December 1953. Mr. L. B. Chandrasekera, B.SC. (Hons.) Ceylon, was appointed, He will assume duties on 1st January 1954.

Mr. W. G. V. Fernando carried on his duties as Laboratory Assistant to the Botanical Department and Computer throughout the year. He has been responsible for the statistical summaries and analyses of records of field experiments.

Mr. C. Amaracone, Laboratory Assistant continued work at the Nivitigalakele field station.

The field experiments on Dartonfield, Nivitigalakele and Hedigalla stations are supervised by six Experimental Conductors and sub-staff, who work under the direct control of the Estate Superintendent and whose services are shared with other departments.

ADVISORY WORK

Correspondence

The major part of the correspondence was connected with planting material, which included advice on replanting programmes, identification of clones, and distribution of planting material from our nurseries at Nivitigalakele.

Inward correspondence	...	1592
Outward ,, ...	...	1268

With the introduction of the Government sponsored and subsidized Rubber Replanting Scheme for in 1953, the writer has been called upon to give attention to the approval of seed gardens on estate plantations. The work of identification of planting material in budwood nurseries in all cases entails the visit of a specially trained field officer and a careful report of the material identified. The correspondence and the arrangements in connexion with such visits has been taken over by the Estate Superintendent during the last quarter. The reports are scrutinized and despatched by the Botanist, with the necessary comments.

Publications

(1) Advisory Circular No. 38, ''Planting and Aftercare of Budded Stumps and Stumped Budgrafts'' (superseding circular No. 8).

(2) Advisory Circular No. 39, ''Clonal seed as Planting Material'' superseding circulars Nos. 26 and 27.

(3) A circular on "Rubber Replanting" was prepared in collaboration with other departments for publication by the Rubber Rehabilitation Board.

The following papers were prepared and read by the Botanist at the 3rd Conference of the Rubber Research Institute of Ceylon, held in November 1953.

(1) "Planting Material"
(2) "Tapping and Tapping Systems".

Field Experiments

The major part of the work of the Botanical Department is confined to field experiments for testing out new planting material. The size of the experiments range from 5 to 35 acres for large scale clone and seedling trials. The work entails the recording of growth and yield on a per tree basis together with observations on other secondary characters.

Owing to the rapidly increasing acreage of long term experiments on planting material, which threatens to overwhelm the work of the recording staff, it has been found necessary to discard the statistical layout of the clone trials as soon as the areas come into tapping, and continue test-tapping of clones and seedling families which show early promise of good growing qualities and high yields. It is considered unnecessary to carry out strict statistical analysis of voluminous yield data, in order to select a few of the promising clones from variety trials of 30 or more clones, especially when other secondary growth characteristics have to be taken into consideration. Clones finally selected are then planted out in replicated plots of 200 trees each, which make a convenient tapping task. These areas can then be tapped accurately on a semi-commercial scale, and clonal yields can be statistically analysed and compared with control clones, both foreign and local, which have already been planted on a large scale.

Most of the clones comprising approximately 4,000 on trial in areas planted out from 1941 onwards are established as 5 tree clones from hand pollinated seedling crosses of selected foreign and local clone parents. The budgrafts are made from the main-stem buds, when the seedlings are about two years old. The Dutch workers in Indonesia have called these "Juvenile type budgrafts" as compared with "Mature type budgrafts" from normal branch-budwood used for large scale production of buddings in commercial practice. The former can be expected to show intermediate characteristics between seedlings and budgrafts in the early stages of growth.

Wherever possible the yields of clones are compared with their seedling mother trees, and it is evident that the reproduction of the high yielding characteristics of the mother seedling trees by budgrafting is not always assured. Observations on crown-budding effects, "Avenue" or "Hedge" planting methods were continued on growth characteristics. These areas will be in tapping from 1955.

Crown buddings with heavy crowns show better growth of the centre-budded section than centre-section crown-budded with clones with sparse foliage ; this is to be expected. It appears that the use of clone LCB870 with its Oidium resistant foliage and well developed crowns will stimulate good growth on the centre budded sections. Crown budding in the third and fourth years of growth of budded trees gives a set-back of about 2½ years in growth according to girth measurements. This operation is ideally carried out, when the budgrafts are under two years of age.

The growth in "hedge" planted areas remain normal after 4½ years' growth. The open avenues are considered to stimulate early branching which it is thought accelerates growth due to increased assimilation. With good growth there is no reason to doubt that high yielding clones will yield normally on this system of planting.

New ground and erect covers have been tried out in clearings. Among erect covers Flemingia congesta and Guatemala grass have been planted along contours for observations on soil conservation and protection of the young budgrafts. The grass has been introduced to tea land in recent years. Stylosanthes gracillis, Rhynchosia, rufescens and Mimosa invisa inermis are being tried as ground covers.

The work of the Botanical Department in the experimental stations of the Institute is reviewed for 1953 :—

Rainguard Experiment, 1934, Replanted Area, 7½ Acres, Dartonfield

This experiment, which provides a comparison of yield output on trees with and without reinguards, was continued in 1953. The area consists of three clones GI 1, AVROS 256, and PB25, each clone having an equivalent number of trees with and without rainguards. The preliminary yield data between paired tapping tasks within the same clone, before the introduction of the rainguards indicate differences in yield of about 11%. Special attention must be given to these initial differences between control areas and areas where rainguards are introduced in tapping trials. Differences in clonal material, periods of tapping and acreages used must be balanced if an accurate estimation of the usefulness of rainguards is to be made for increased economic yields. These preliminary precautions have been ignored in estate trials and in many cases greatly increased yields have been reported which cannot be substantiated by a strict statistical survey of the figures with a satisfactory control area.

In 1953 the rainguards were transferred to the control areas of 1952 which were originally the poorer yielding areas and so get the benefit of the correction for initial yields in 1953. The increased yields are again far below the standard reported from some estates as is shown below.

Rainguard Experiment, 1934 Replanted Area, 7½ Acres Dartonfield

	Rainguards	*Control*
Preliminary yields March to June 1951 ...	804.9	896.6 lbs.
Experimental yields Jan. to Dec. 1953 ...	2416.3	2421.5 „
Approx. adjusted yields for preliminary differences	2462.2	2375.6 „
Excess yields	86.6	
As per cent of control	3.6	

Analysis of tapping days Jan. to Dec. 1953

Normal tapping days	217
Late tapping days	52
No tapping due to rain	25
Estate holidays	9

The area was rested for wintering from 13th January to 15th March.

The Botanical Department depends entirely on estate routine tapping for decisions to tap the trees on days interfered with by wet weather and in this area the only advantage for rainguards has been an earlier tapping on number of days due to quicker drying out of tapping panels. After rain-storms both guarded and unguarded panels have been equally affected and resulted in no tapping. After two years of observation, it has been decided to discontinue this experiment. The Institute is prepared to examine any data supporting claims of substantially increased yields from estates, provided there is sufficient information on the layout of the trial, which enables one to make a valid comparison between tasks tapped with and without rainguards. Preliminary yields of such tasks before the introduction of rainguards must be available.

1941 Replanted Area, 6½ Acres, Dartonfield

Five clones of the RRI. "500" series are planted in this area, the trees were first tapped in March, 1948. The yield results from 1951 to 1953 are summarized together with the yields of clonal seedlings which were planted in an adjacent area as a control for the original stock-scion experiment on this area :—

RRI "500" SERIES

Yield in lbs. d.r.c. per tree per year, tapped S 2, d 2, 100%

Clones	RRI 500	RRI 501	RRI 506	RRI 520	RRI 514	Clonal Seedlings
No. of trees tapped (1953)	78–80	69	40	69	82	90
Yield 1951	10.2	17.2	10.3	9.7	6.5	8.9
,, 1952	7.2	14.9	8.0	8.7	6.1	9.1
,, 1953	10.6	17.1	14.7	10.6	10.3	11.3

With good refoliation and effective Oidium control in 1953, the yields have recovered considerably. The yields of clone RRI. 501 have been outstanding and in recent years the clone has been recommended for large scale planting on estates.

Clonal Seedling Trial, 1947 Replanted Area, Dartonfield

The following clonal seedling material is planted in this area.

(1) TJ.1 (selfed) collected centrally from a large monoclonal block on a commercial estate.

(2) PB86 illegitimate seed collected from a PB86 area on a commercial estate, this seed includes crosses with other clones especially GL.1.

(3) PB5 139 seed from Dartonfield Estate, ground picked from under 30 trees surrounded by clones AV255, BR2, and AV163.

(4) Collection of Hand Pollinated Seedlings representing the produce of a hypothetical seed garden with clone parents TJ.1, BR.2, AV. 163, AV.255.

The boundary areas of this plot have been planted with seed of Clone GL.1. collected centrally from a monoclonal block on a commercial estate.

The experiment consists of 8 replications of each type of clonal seed and the budded control clone TJ.1, each replication contains 30 trees.

The trees were selectively thinned from 260 to 160 trees per acre in July, 1951 based on the Morris-Mann system of early tapping. Commerical tapping commenced in 1952. Test-tapping is carried out twice monthly on a per tree basis. The results are presented in Table II.

TABLE II

Clonal Seedling Trial, 1947 Replanted Area, Dartonfield

Tapping System S/2, d/3, 67%. Yield of dry rubber shown in grms per tree

Planting Material	Yield of Clonal Seedling				Yield of Budded TJ. 1	Mean	Error	Sig. diff. .05
	TJ.1	PB86	PB5/139	H.P. seed-lings				
Morris-Mann yields for 5 tappings in grms d.r.c. 1951	24.1	18.2	30.4	29.8	Not tap-ped	—	—	—
Yield tree/tapping 1952	10.0	8.5	14.8	15.1	19.5*	—	—	—
Yield tree/tapping 1953	15.3	13.2	20.3	21.6	20.2	18.1	0.78	2.3

The correlation coefficient (r) showing the relationship between the Morris Mann early tapping yields, and those of the mature trees for 1953 on a per plot basis works out at .6911, the significant figure for the number of comparisons is .4487 at the (.01) level. The figures show that the selection of high yielding trees on the Morris-Mann early tapping system is reliable.

It should be noted that the budded TJ.1 trees in this experiment have been selectively thinned on girth figures from 260 to 160 per acre. The control figure of 20.2 is therefore, on the high side compared with yields of clone TJ.1 in commercial plantations. Seedlings types PB5/139 and hand pollinated seedlings have come up to the standard of the budded control but this type of seed is rarely obtainable for commercial planting on a large scale.

Although the seed of clone PB86 shows the poorest yields again in 1953, the difference compared with TJ.1 seed just fails to come up to the standard of significance for a (.05) probability test. The tapping cuts were opened at the maximum heights for seedlings and budgrafts. Increased yields can be expected from the seedlings in later years, as the cuts work down to the root-collar, at a higher rate than for budgrafts. The seed of clone PB86 of particular crosses given elsewhere in this report has given satisfactory results, but seed now available from large monoclonal blocks of this clone in this country cannot be recommended for large scale planting, until the early plantation yields of this seed are sufficiently investigated.

About 60 GL.1 illeg. seedlings in the boundary areas test-tapped in the last quarter of 1953 gave an average yield of 18.9 grams per tree per tapping. These seedlings were planted out at the same time as the other seedlings.

*Tapped from Sept. to Dec. 1952.

1950 Replanted Area, 23 Acres, Dartonfield

This area was planted in August, 1950, with 5 tree clones established from 1945 hand pollinated seedlings planted in the 1947 clearing at Hedigalla, This area was badly affected with Fomes root disease, and a considerable number of supplies were introduced as stumped budgrafts. Girth measurements were taken in August 1953. The average girth was 8.04 inches.

1950—51 Replanted Area, 5 acres, Dartonfield

This area is a continuation of the 1950 area of 5 tree clones. The budgrafts were planted in May-July 1951. The average girth figure in August 1953 was 5.10 inches.

1952 Replanted Area, 31 acres, Dartonfield

This area consists of a large scale clone trial, with clones NAB 12, 15 and 20, RRI. 501, and PB86 in 200 tree plots replicated in 5 blocks, Boundary areas were planted with clone NAB.17, which is high yielding but has shown a high percentage of Brown Bast cases in the limited number of original budgrafts tapped in the 1939 trial. The average girth was 2.99 inches for approximately 15 months growth.

1939 Clearing Field 6A, 10½ Acres, Nivitigalakele

Test tapping was continued on 8 clones selected from the 37 clones originally included in this trial. The yields together with bark thickness for the last five tapping years are given in table III. The trees were first tapped in 1945. Clones NAB.12, 15 and 20 have been planted in a large scale clone trial at Dartonfield and compared with clones PB86 and RRI 501 as controls. Each clone has an area of about 6 acres on a total acreage of 35 acres. The renewed bark of these NAB clones is quite satisfactory for 8 years of development, except in the case of Clone NAB.16, which is not favoured for further testing.

TABLE III

1939 Clearing, Field 6A, Tapping System S 2, d 2, 100%

Clone	No. of trees tapped	Yield in lbs. d.r.c. per tree/ year—140 tappings					No. Brown Bast trees	Bark thickness in mms	
		1949	1950	1951	1952	1953		Virgin	Renewed (8ys.)
NAB. 3 ..	18—20	12.1	11.4	11.0	12.8	12.5	4	8.4	7.1
NAB. 8 ..	17—20	11.0	11.0	11.2	12.2	11.3	8	9.1	8.1
NAB. 11 ..	17—18	10.8	10.9	10.8	11.1	11.3	3	8.4	7.4
NAB. 12 ..	19	13.3	15.1	15.4	17.4	16.9	5	8.6	7.6
NAB. 15 ..	18—20	15.9	15.0	14.7	13.6	14.7	3	9.8	8.8
NAB. 16 ..	17—19	10.8	9.1	8.4	8.1	7.7	3	7.6	6.5
NAB. 17 ..	17—20	15.2	14.9	14.2	15.6	16.0	9	8.3	7.7
NAB. 20 ..	12—18	15.5	16.7	14.6	18.4	15.6	6	8.3	7.4
CONTROLS									
PB86 ..	20	13.2	13.0	15.3	17.3	17.6	—	8.6	7.9
WG.6278 ..	16—19	7.9	8.0	8.1	8.5	11.0	3	8.5	7.7
MK3/2 ..	16—19	9.9	10.4	11.2	12.5	12.3	5	8.9	7.9

1940 Clone Trial Field 6B, 9½ Acre, Nivitigalakele

A number of selected foreign clones together with two local clones are being tested in this area. Clones TJ.1 and WG.6278 are used as controls. The trees were first tapped in January, 1947. The yield results for the last 5 years are summarised in Table IV, together with bark thickness figures. Yield increases in 1952/53 are not encouraging in most clones. This area has been badly affected with Oidium in the higher elevations. This area was used for an Oidium control trial in 1952 and has suffered accordingly. Careful attention will be given to this area in the dusting season for 1953. Under the conditions of the experiment the foreign clones recommended for planting on a large scale have given results which justify our recommendations.

The bark development of clones WAR 4 and RRI 513 is not up to the standard of other clones. Clone RLD1 is particularly satisfactory in that respect. This local clone was put out for a final trial on a large scale at Hedigalla in 1952.

It is interesting to note the good recovery of clone TJ.1 which produced 13.6 lbs. d.r.c. per tree per year.

TABLE IV

1940 Clone Trial, Field 6B Tapping System S 2, d/2, 100%

Clone	No. of trees tapped 1953	Yield in lbs. d.r.c. tree/tapping Year—140 tappings					No. Brown Bast trees	No. wind damaged trees	Bark Thickness	
		1949	1950	1951	1952	1953			Virgin	Renewed 7 yrs.
AV255 ..	13—18	9.9	13.3	12.3	15.1	12.8	9	6	9.0	7.5
RR1501 ..	16—19	11.7	10.8	13.0	13.9	14.7	6	4	8.5	7.0
RLD.1 ..	23	8.0	9.8	10.5	12.3	11.1	—	—	10.7	8.7
PR107 ..	22—23	10.1	10.1	10.5	11.6	11.2	3	1	8.8	7.3
WAR4 ..	23—24	7.3	9.7	8.7	11.0	10.7	2	—	8.3	6.4
RRI513 ..	24	11.2	10.5	9.2	11.1	10.1	1	—	7.8	6.5
AV352 ..	15—20	7.7	9.2	9.5	11.3	12.0	7	4	9.6	8.0
LUN.N ..	19—21	8.2	9.7	8.9	10.5	11.7	4	2	9.0	7.2
PR105 ..	23	8.4	9.2	8.9	10.0	10.8	3	—	9.0	7.7
PB6/50 ..	22	8.9	11.1	9.5	9.3	9.8	5	1	9.7	7.9
RRI519 ..	20—21	7.1	8.0	7.9	8.8	9.4	7	3	7.9	6.5
RRI504 ..	23—24	8.0	6.9	7.4	7.7	9.3	1	—	8.5	7.1
RRI511 ..	20—22	7.3	6.9	6.5	7.7	7.0	8	—	8.5	7.2
RRI500 ..	21—22	7.1	10.0	6.4	6.8	6.9	2	1	7.8	7.1
CONTROLS										
TJ.1 ..	20—23	8.1	10.8	10.8	7.7	13.6	6	1	8.7	7.2
WG.6278 ..	22	6.5	9.4	8.1	9.7	10.6	—	2	9.1	7.7

1941 Clearing, Field 6C, 7 Acres, Nivitigalakele

The 1939 hand pollinated seedling families and selected clones derived from these seedlings are being test-tapped in this area. The results given by the seedlings and clones are presented in tables VA and VB respectively. The seedling mother tree yields of the selected clones are also included in table

VB. The trees were first tapped in 1947. In most cases the yields of individual clones are better than the average yield of the seedling family, from which the clones are derived, except in the case of the seedling family RLD 8 × WG 6278, which in 1953 produced 19.9 lbs. of rubber per tree per year. The best clone from this family, RLD 14, gave 17.1 lbs. while its mother seedling tree yielded 30.5 lbs. for the same tapping year. All the RLD clones selected from a total of 110 in the 1941 area will be planted in large scale clone trials of 6 acres each. 200 tree plots will be replicated in 5 to 6 blocks.

TABLE VA

1941 Clearing, Field 6C, Tapping System S 2, d 2, 100%

Seedling Family	No. of trees tapped 1953	Yield in lbs. d.r.c. per tree/year 140 tappings					No. Brown Bast trees	No. wind damaged trees
		1949	1950	1951	1952	1953		
RLD8 × MK3/2 ..	46—47	8.2	9.4	11.5	12.2	14.2	8	—
RLD8 × Pil.A.44 ..	36—37	6.5	7.7	8.3	9.0	10.1	5	—
Pil. A.44 × WG6278 ..	18	5.6	7.4	8.7	9.1	10.9	1	—
RLD8 × WG6278 ..	40	15.0	13.6	15.6	16.6	19.9	2	2
Pil. A.44 × RLD. 8 ..	15	5.2	6.2	6.3	6.8	7.3	1	—
Control								
WG6278 (Budded) ..	40				9.0	11.3	1	1

1942 Clearing, Field No. 7, 5 Acres, Nivitigalakele

The 1940 hand pollinated seedlings are planted on this area with some illegitimate seedlings of clone AV 185. Test-tapping was continued in 1953 on the clonal seedling families with over 20 seedlings per family for assessing the value of seed parents. Clone WG6278 is being tapped as a budded control. The trees were first tapped in 1949. The yield figures are summarised for the five years 1949—1953 in table VI. While the budded control shows a drop in yield, the seedling families show a satisfactory yield increase for 1952/53. The local clone RLD8 crossed with TJ.1 is especially promising.

TABLE VI

1942 Clearing, Field No. 7 Tapped S/2, d/2, 100%

Seedlings Family	No. of trees tapped	Yield in lbs. d.r.c. per tree/year 140 tappings					Brown Bast trees	Wind damaged trees
		1949	1950	1951	1952	1953		
RLD8 × HC28 ..	66—68	3.0	4.8	6.9	7.1	8.5	5	1
RLD8 × TJ1 ..	63—69	4.0	6.8	9.4	10.0	13.2	11	4
AV185 illeg. ..	21	3.0	4.6	7.5	8.4	10.6	—	1
WG6278 (Budded Control)	63	4.5	5.9	8.4	12.9	9.8	—	4
Boundary Trees								
RLD8 × HC28 ..	61—62	—	—	6.3	6.6	8.9	4	1
RLD8 × TJ.1 ..	27—28	—	—	8.4	9.7	13.8	3	6
WG6278 (Budded Control) ..	55	—	—	7.9	11.7	9.4	1	4

TABLE VB——1941 Clearing, Field 6C, Tapping S2, d2, 100%

Mother tree No. Seedling Family	Test pricking class*	Yield in lbs. d.r.c. per tree/year —140 tappings					Derived clone **	No. trees tapped	Yield in lb. d.r.c. per tree/year 140 tappings					No. Brown Bast trees	Bark Thickness in mms	
		1949	1950	1951	1952	1953			1949	1950	1951	1952	1953		Virgin	Renewed. 6 yrs.
28, RLD8 × MK3/2	1	9.7	11.5	14.7	19.1	23.8	RLD9	4	12.5	13.7	13.8	15.7	13.0	—	10.0	9.0
43, RLD8 × MK3/2	3	11.2	11.7	19.5	16.5	27.4	RLD16	5	8.9	10.2	13.4	15.5	17.0	—	10.0	8.4
44, RLD8 × MK3/2	3	6.7	10.0	11.1	13.9	8.8	RLD17	4	9.0	10.8	12.4	14.9	17.4	1	10.3	8.8
50, MK3/2 × WG6278	3	9.3	19.5	15.7	—	—	RLD10	5	11.2	15.8	11.6	14.8	14.9	—	9.0	8.0
39, RLD8 × MK3/2	2	6.2	9.1	12.2	9.7	22.6	RLD51	5	11.4	10.4	13.9	14.6	17.2	1	10.6	9.6
110, Pil. A. 44 × WG6278	2	—	—	—	—	—	RLD11	5	9.2	12.1	10.4	14.6	12.7	—	8.6	6.8
185, RLD8 × TJ.1	1	10.1	13.0	14.3	—	—	RLD58	3	9.4	8.5	11.7	14.6	13.7	2	9.3	9.3
31, RLD8 × MK3/2	2	10.2	11.6	10.4	17.2	12.0	RLD12	5	9.6	11.4	11.5	14.3	15.1	—	9.0	8.4
16, RLD8 × MK3/2	1	10.7	12.4	13.2	8.9	15.1	RLD13	3—5	13.5	14.5	13.3	14.2	12.8	2	9.6	9.2
38, RLD8 × MK3/2	2	9.0	10.0	BB	11.4	8.5	RLD18	5	8.5	9.7	10.6	13.2	12.6	1	8.8	7.8
40, RLD8 × MK3/2	2	9.1	10.1	15.5	13.4	13.7	RLD19	4	11.5	11.3	11.5	13.8	15.9	1	9.3	7.8
41, RLD8 × MK3/2	1	18.1	19.6	BB	26.4	20.8	RLD20	5	11.6	9.7	11.6	13.5	14.1	2	10.0	8.4
147, RLD8 × WG6278	1	15.3	22.6	22.9	20.5	30.5	RLD14	4—5	10.8	11.8	13.7	13.2	17.1	1	9.8	9.2
120, RLD8 × WG6278	2	8.3	7.7	(uproooted)			RR169	5	8.5	8.9	11.6	12.5	15.0	—	9.6	8.2
21, RLD8 × MK3/2	2	8.3	9.8	11.0	14.5	14.3	RLD21	5	9.6	10.1	11.7	12.5	16.1	2	9.2	8.6
47, RLD8 × MK3/2	1	8.3	11.9	13.3	16.9	15.6	RR131	5	8.6	9.5	11.6	12.4	13.5	1	8.8	8.2
183, WG6278 × MK3/2	4	9.8	11.2	BB	—	—	RLD15	3	14.0	9.7	8.2	12.2	10.9	1	9.7	8.7
118, RLD8 × WG6278	2	11.1	16.2	10.0	20.7	14.5	RLD22	5	8.8	9.1	12.4	12.0	16.2	2	8.8	7.4
129, RLD8 × WG6278	1	10.5	11.1	11.9	13.5	17.3	RLD23	5	9.6	11.1	10.6	12.0	15.6	—	8.8	8.0
34, RLD8 × MK3/2	—	7.8	10.5	14.0	15.3	17.6	RLD24	5	9.5	9.5	12.1	11.9	14.5	—	10.8	9.6
186, RLD8 × TJ.1	2	5.2	8.9	9.4	—	—	RR198	5	9.1	9.1	11.0	11.4	13.9	1	8.6	7.4
36, RLD8 × MK3/2	2	8.5	11.1	13.5	12.7	16.2	RLD25	5	10.8	10.3	11.3	10.8	13.9	—	9.0	7.6
77, RLD8 × Pil. A. 44	2	9.5	13.7	15.0	8.8	17.7	RLD26	5	9.3	10.0	10.3	10.8	10.7	—	8.8	7.0
91, Pil. A. 44 × WG6278	1	5.6	9.8	7.7	6.6	5.2	RLD27	4	10.8	10.7	13.3	10.9	9.2	1	8.8	6.5
184, WG6278 × MK3/2	3	7.3	8.5	6.5	—	—	RR196	5	10.3	8.9	8.4	9.4	9.2	—	8.6	8.3

*Test-pricking class. No. 1—5 respresents No. 1 as the best class.

**All RLD clones will be planted out in large scale clone trials in 1954 and 1955 of 5 to 6 acres each.

TABLE VII

1944 Clearing, Small Scale Clone Trial, Field 8, Tapped S 2, d 2, 100%

Mother tree No.	Seedling and Family	Test-atex class *	Yield in lbs. d.r.c. Tree/year (140 tappings)			Derived Clone and Control	Yield in lbs. d.r.c. Tree/year (140 tappings)		
			1951	1952	1953		1951	1952	1953
101	RLD8×TJ.1	1	10.1	16.1	10.3	2/101	6.4	9.9	13.6
						WG6278	5.9	6.0	9.3
105	RLD8×TJ. 1	1	8.9	12.2	10.9	RLD39	6.9	11.0	14.8
						WG6278	4.3	5.1	6.8
5	HC28×WG6278	4	17.0	—	—	5/5	6.1	9.8	12.5
						WG6278	5.0	7.0	7.6
132	RLD8×HC28	1	11.8	13.8	14.9	1/132	5.6	6.4	10.2
						WG6278	5.0	5.7	7.7
115	RLD8×HC28	1	12.1	10.3	7.9	RLD28	9.7	14.9	15.2
44	RLD8×HC28	1	5.6	6.0	7.9	1/44	6.7	8.6	9.2
						WG6278	4.3	5.1	8.8
1	I11. AV. 185	1	10.7	14.9	25.3	7/1	6.5	8.0	9.6
3	RLD8×HC28	1	11.8	15.6	15.9	RLD40	6.4	11.9	15.1
						WG6278	4.3	3.3	4.6
101	RLD8×HC28	1	9.1	7.7	6.3	RLD59	7.1	10.9	15.6
37	RLD8×HC28	2	13.7	10.0	B.B.	1/37	6.6	9.6	11.9
81	RLD8×HC28	1	4.9	6.6	6.6	RLD29	8.0	10.5	15.5
						WG6278	4.6	6.6	8.8
41	RLD8×TJ.1	1	B.B.	7.6	10.1	RLD30	8.8	10.5	14.4
28	RLD8×TJ.1	1	11.7	10.5	18.7	2/28	—	7.7	10.6
14	RLD8×TJ.1	1	15.1	15.4	23.9	RLD41	7.3	12.6	16.2
						WG6278	4.6	4.6	6.5
18	RLD8×TJ.1	1	9.7	8.4	8.3	RLD31	8.0	10.0	13.6
33	RLD8×TJ.1	1	7.9	8.4	7.1	2/33	6.5	7.2	10.0
						WG6278	5.1	6.1	9.3
35	RLD8×TJ.1	1	10.0	5.8	B.B.	RLD42	6.8	11.1	14.9
78	RLD8×TJ.1	1	5.9	W.D.	—	2/78	6.0	6.1	8.4
18	I11. AV.185	1	11.8	17.0	21.8	RLD43	6.1	10.0	10.1
						WG6278	3.9	4.4	6.0
48	RLD8×HC28	1	12.6	17.0	20.5	1/48	6.0	8.1	10.7
111	RLD8×HC28	1	11.3	11.3	12.1	1/111	5.9	9.2	13.4
						WG6278	5.2	5.8	8.1
17	RLD8×HC28	1	5.4	5.7	8.4	RLD44	5.6	11.9	15.1
						WG6278	5.7	6.9	9.2
121	RLD8×HC28	1	9.0	12.2	17.7	1/121	6.3	7.9	10.4
40	RLD8×TJ.1	1	6.6	10.8	13.8	2/40	5.7	9.1	15.6
						WG6278	3.9	4.4	6.9
96	RLD8×TJ.1	1	7.5	8.1	11.1	RLD45	7.4	14.7	20.3
103	RLD8×TJ.1	1	10.4	8.6	3.9	2/103	5.8	9.3	10.2
						WG6278	5.1	6.1	9.9
127	RLD8×HC28	1	24 8	19.6	20.5	1/127	5.7	6.7	8.6
						WG6278	4.3	5.5	7.8

1944 Small Scale Clone Trial, Field 8, 4½ Acres, Nivitigalakele

Ninety clones established from the 1944 hand pollinated seedlings are planted in this area as 3 tree clones. Clone WG6278 was allocated to groups of 5 clones in a balanced incomplete block layout in the initial experiment.

Test tapping was continued in 1953 on selected clones and Table VII gives the yield data from 1951 to 1953. The trees were first tapped in 1951.

*No. 1 represents best yielding class.

RLD clones will be planted in large scale clone trials in 1954 and 1955

1946 Replanted Area, 21 acres, large scale clone trial. Nivitigalakele.

A selection of foreign clones was planted in this area in October 1946. Plots of 64 trees of each clone are replicated 8 times in a straight-forward randomized block layout. Girth measurements were taken in January, 1954 and tapping commenced in March, 1953. The results for 1953 54 are summarised in Table VIII.

The trees were tapped on reaching a girth of 18 inches and the tapping for the first three years will be on the S/2, d/3, 67% system.

TABLE VIII

1946 Large Scale Clone Trial Nivitigalakele Tapped S/2, d/3, 67%

Clones	AV 255	AV 352	PB 6/9	PB 5/60	LCB 1320	CHM 3	TJ. 1	PR 107
*Yield in lbs. dry rubber per tree/ year ..	3.91	3.25	6.25	5.74	3.91	3.75	3.89	3.39
Girth in inches 1953 ..	21.3	19.5	21.7	18.8	20.1	19.5	18.3	17.1

On a 67% intensity tapping all clones have given satisfactory yields. Clones PB6/9 and PB5/60 have done exceptionally well in the first tapping year. The former is highly susceptible to Oidium, more so than most other clones.

"A" and "B" Budgrafts of Clone MK3/2

The budgrafts in series "A" and "B" were established from branch budwood taken from the highest and lowest yielding trees of the original MK3/2 budgrafts planted in 1928. The yields of the old MK3/2 budgrafts selected for budwood were as follows in 1946:--

Highest yielding tree "A" gave 4.1 grams dry rubber per inch of cut per tapping.

Lowest yielding tree "B" gave 1.3 grams dry rubber per inch of cut per tapping.

Fifty budgrafts each of the "A" and "B" series planted alternately in 1947 gave the following yields from October to December of 1953, in the first tapping months.

	Grams/tree/tapping
Clone MK3/2 "A" series	15.6
,, ,, "B" ,,	16.3

It is evident from these early yields data that environment and stock effects, which cause a variability in tree to tree yields within a single clone can have no effect on the genetic constitution of the trees, which remains the same within the

*Yield from March to December 1953.

vegetatively propagated clone. The buds of branch-budwood taken from any budded MK3 2 tree, therefore, retain their original genetic potentialities for growth and yield in a new environment. This is true of all clones. The test-tapping will be continued.

1943 Clearing, Legitimate Seedling Trial, 4 5 8 Acres, Hedigalla

The legitimate seedlings planted in this area consist of hand pollinated seed from crosses made in 1941. Clone WG6278 has been planted as a control. The trees were first tapped in September, 1950. Test-tapping commenced in May 1951. The yield figures are summarized in Table IXA. The high yielding qualities of clone PB86 when crossed with clones PR107, TJ.1, RLD8, M162 have been maintained in the second tapping year. The local clone RLD8 again shows up as a reliable seed parent.

Table IXA

1943 Clearing, Legitimate Seedling Families, 1941 Hand Pollinations Tapped S/2, d/2, 100% Yield in lbs d.r.c. per tree per year 140 tappings

Seedling Family	No. of trees tapped	Yield	
		1952	1953
RLD8 × DBK 1 ...	58—61	7.8	8.4
RLD8 × TJ.16 ...	14	10.2	9.9
DBK 1 × MK3/2 ...	15	7.6	7.6
TJ.1 × PB86 — ...	25	8.1	9.4
PB86 × TJ.1 —			
PB86 × M 162 ...	14	8.5	9.2
PB86 × PR 107 ...	24	11.8	13.2
M3 (RR9) × RLD8 ...	11	6.2	6.0
RLD8 × PB86 ...	4	11.8	13.5
DBK 1 × WG 6278 ...	4	6.8	7.4
HC.55 × TJ.1 ...	3	9.2	6.9
HC.55 × WG6278 ...	2	8.0	6.9
RLD8 × G771 ...	3	14.3	14.0
DK3513 × RLD8 ...	2	14.2	13.5
Control Budded WG 6278 ...	86—91	7.1	6.7

1943/44 Clearing, Small Scale Clone Trial, 14 Acres, Hedigalla

This area is planted with 280 five tree clones established from the 1941 hand pollinated seedlings. Tapping commenced in September 1950. Yields of selected clones are given in Table IXB. Most clones given " RLD " numbers will be planted out in large scale clone trials in Hedigalla in 1954 and 1955. Each clone will be planted on 5 to 6 acres with 200 tree plots replicated in randomized blocks. The 1954 trial will have a total acreage of 122 acres.

TABLE IXB

1943 Clearing, 5 Tree-clones and Mother Tree Seedlings—Yield in lbs. d.r.c, per tree per year, Tapped S/2, d/2, 100%

No.	Seedling Mother trees	Yield			Derived clones (Budded)	Yield	
	Cross	1951	1952	1953		1952	1953
16	RLD8×DBK.1	11.1	14.9	10.8	RLD37	18.6	15.2
10	PB86×PR107	15.8	—	—	RLD36	16.9	18.5
7	PB86×PR107	22.1	21.2	17.9	RLD46	15.6	13.5
8	RLD8×DK5315	6.0	9.9	—	RLD33	15.1	14.0
14	DBK1×MK3/2	9.6	13.5	17.3	RLD47	13.4	14.5
9	TKD113×RLD8	12.3	13.4	—	RLD48	12.7	14.5
14	MK1/3×TJ.1	12.3	12.8	—	RLD49	12.6	13.7
1	RLD8×H24	8.6	13.0	—	RLD32	12.6	10.4
10	TJ.1×PB86	13.8	13.9	16.7	RLD50	12.2	12.6
1	RLD8×DK5315	6.3	6.9	—	12/1	12.2	11.0
1	PB86×TJ.1	4.8	7.0	8.0	27/1	12.0	7.6
1	M65×Pil.B84	10.3	14.5	—	28/1	12.1	7.9
24	PB86×PR107	8.1	10.4	16.2	30/24	12.0	10.1
1	RLD8×TJ.16	8.9	15.4	17.5	9/1	11.6	12.3
2	RH10×TJ.1	6.9	15.5	—	14/2	11.5	9.7
11	RLD8×DBK1	7.1	10.8	12.5	7/11	11.0	9.6
11	RLD8×TJ.16	9.0	9.3	8.2	RLD34	11.4	8.8
10	PB86×TJ.1	15.6	16.7	21.0	RLD35	11.1	11.7
11	TKD113×RLD8	12.3	12.8	—	22/11	11.0	10.9
18	PB86×PR107	11.7	13.7	13.1	30/18	11.0	8.3
3	RLD8×PB86	—	—	—	11/3	10.9	11.0
2	PB86×PR107	7.8	10.5	11.5	30/2	10.6	11.8
42	RLD8×DBK1	1.8	6.2	9.3	7/42	10.6	8.8
23	PB86×PR107	10.6	12.0	17.2	RLD38	9.4	10.6
9	PB86×M162	—	—	—	31/9	—	13.2

1944 Small Scale Clone Trial 1¼ Acres, Hedigalla

Five trees each of 16 clones are tested in this area. The experimental layout was abandoned in 1952 and test-tapping was continued on a selection of clones made at the end of 1952. Except for clone PB6/5 and RLD52 which have already been planted out in large scale clone trials the yields of the other clones do not warrant immediate consideration for trial on a larger scale. The yields for 1952 and 1953 are summarized in Table X.

TABLE X

Small Scale Clone Trial, Hedigalla

Tapped S/2, d/2, 100%, Yield in lbs. per tree per year on 140-tappings

Clone	Yield		Clone	Yield	
	1952	1953		1952	1953
RR20 ...	4.6	4.9	RLD52 ...	7.2	8.3
RR23 ...	5.5	5.8	RR29 ...	6.4	7.7
RR24 ...	6.5	7.8	AD24 ...	4.7	3.8
RR25 ...	7.5	9.5	PB5/122 ...	7.1	7.6
RR27 ...	5.2	3.6	PB6/5 ...	10.3	9.1
			WG6278 (Control)	6.2	6.3

1944 Clearing, Stem Branch-Budding Experiments 1¼ Acres, Hedigalla

This trial affords a study of bud-variation in the main stem and branches of seedling trees. H1 and H2 represent budgrafts from true stem-buds taken from the lower and upper end of 10 seedling stems and "B" represents budgrafts made from the first order branches of the same 10 seedlings. The 3 types of budgrafts H1, H2 and "B" are replicated fivefold within each of the 10 clones giving fifty comparisons. Tapping commenced in May, 1951.

The results are summarized in Tables XIA and XIB for 1951 and 1952.

TABLE XIA

Yield in lbs. d.r.c. per tree per year, tapped S 2, d 2, 100%

Clones	1/130	1/5A	2/72	1/3A	2/32	1/1A	2/23	2/63	1/4A	2/108
1952	4.9	5.6	5.8	2.8	6.6	4.8	8.4	6.7	2.6	7.3
1953	4.7	6.3	5.6	3.5	7.0	5.5	9.9	6.5	2.7	7.7

TABLE XI B

Bud Type	Yield in lbs. per tree per year 1952	1953
H1	5.3	5.9
H2	5.7	6.3
"B"	6.0	5.6

The yields of the 3 types of budgrafts were not different to an extent which is statistically significant in 1952 and 1953.

In Indonesia budgrafts from the main-stem buds have been differentiated from normal budgrafts as "juvenile type" budgrafts as against "mature type" budgrafts from branch budwood. In this experiment the H1 and H2 series of buddings showed seedling characteristics in the early years of growth, especially the development of corky bark. The present trees have also a somewhat conical structure of the main stem, but this characteristic is not very marked at 9 years of age. The yields in 1952 and 1953 show no significant differences between the three types of budgrafts. Anatomical studies in bark thickness and development of laticiferous tissue will be made in the three types, while test-tapping is continued in this area.

1945 Clearing, Crown Budding Experiment, 11¾ Acres, Hedigalla

This experiment provides for a study of the effect of crown budding on budded centre sections. The results given in Table XII indicate the general layout of a single block of this experiment which is replicated threefold. Each crown is superimposed on 6 centre sections of 6 clones of 6 trees each, making up plots of 36 trees with a single crown. The 6 centre sections of each clone are crown-budded at a height of 5′ and 8′, making the units of 3 tree sub-plots for the experiment.

The trees in this area were crown-budded in mid 1949 almost 4 years after planting owing to the war. Subsequent girth measurements show a set-back in growth of about 2 years. Crown budding is ideally carried out, when the trees show brown bark at a height of 8 feet. This height is tentatively considered safe for crown-budding for eliminating any undesirable crown-centre section effects and reducing a set-back.

Girth measurements taken in December, 1953 show an average girth of 16.8 inches for the centre sections. It is hoped that this area will be ready for test-tapping at the end of 1954, when the average girth is 18 inches. The crowns are now sufficiently developed and the stems show a more normal increase in girth between December 1952 and December 1953. Centre sections crown-budded with heavy crowns like clone TJ.1, AV256 and PB86 show better growth than the crowns with sparse foliage like clones GL1 and PM17.

Crown budding at heights of 5' and 8' from ground level show no significant differences in influence on growth.

TABLE XII

1945 Crown Budding Experiment, Girth Measurements

Increment in inches for 1952/1953

Centre Budded Sections	Budded Crowns						
	TJ. 1	AV. 256	PM. 17	PB. 86	GL. 1	RUB.393	Mean
TJ.1 ...	3.34	3.58	2.49	3.14	2.42	3.87	3.14
AV256 ...	3.08	2.98	2.48	3.26	2.43	2.97	2.87
PM17 ...	3.37	3.51	2.66	3.24	2.67	3.11	3.09
PB86 ...	2.76	2.94	2.40	3.00	2.50	2.75	2.73
GL1 ...	3.60	3.32	2.33	2.98	2.29	3.66	3.03
RUB393 ...	3.34	3.57	2.65	3.36	2.55	3.24	3.12
Mean ...	3.25	3.32	2.50	3.16	2.48	3.27	2.99

Summary of Girth Increments in Inches from 1950—1953

(Crown-budded in 1949—50)

Crowns	TJ.1	AV.256	PM17	PB86	GL1	RUB393	Mean
Sept. 50—Dec. 51 ..	1.43	1.69	0.49	1.16	0.83	1.10	1.10
Dec. 51—Dec. 52 ..	3.08	3.22	1.75	2.84	2.27	2.29	2·59
Dec. 52—Dec. 53 ..	3.25	3.32	2.50	3.16	2.48	3.27	2·99

Crowns	TJ.1	AV.256	PM17	PB86	GL1	RUB393	Mean
Dec. 1953	17.8	18.8	14.7	17.8	15.2	16.5	16.8

1953 Girth Measurements in inches for height of crown-budding

Crown budding at height of 5 feet from union 16.7

" " " " 8 " " " 16.9

1945 Clearing, Large Scale Clone Trial, 10½ Acres, Hedigalla

In this trial six RLD clones numbering 2 to 7 are being tested against clone TJ. 1. The 6 clones were final selections from 120 three-tree clones established from PBIG seedlings at Nivitigalakele in 1935. Test-tapping commenced in June 1953 on 25 three plots of each clone replicated in three blocks. The average yields for the seven months of 1953 are summarized below :

1945 Clearing, Large Scale Clone Trial, Hedigalla—Tapped S/2, d/3, 67% Yield in grams d.r.c. per tree per tapping

Clones	RLD2	RLD3	RLD4	RLD5	RLD6	RLD7	TJ.1
Yield June to Dec. 1953 ...	25.0	14.7	28.4	27.7	24.0	26.6	21.3

Except for clone RLD3, the selected clones show very promising yields in the first year of tapping. These RLD clones were planted on a large scale clone trial in 1953 with six acres of each clone.

1946 Clearing, Legitimate Seedling Trial, 1943 Hand Pollinated Seedlings

The 1943 hand pollinated seedlings and derived 5 tree clones are planted in this area. The trees were test-tapped in 1953. This area was brought into tapping when the trees averaged 18 inches girth. For the first 3 years the trees will be tapped on a 67% intensity. The results for 1953 are summarized in Table XIIIA and XIIIB, clone TJ.1 was used as a control.

TABLE XIIIA

1946, Clearing, Legitimate Seedling Families, 1943. Hand Pollinations Tapped S/2, d/3, 67%, Yield in gms per tree per tapping Apr.-Dec. 1953

Family	No. of trees tapped	Yield
PB86×TJ.1 ...	13	15.4
PB86×MK3/2 ...	9	23.4
PB86×RLD8 ...	59	23.5
PB86×WG6278	17	24.8
TJ.1×(Budded)	58	14.4

TABLE XIIIB

1946 Clearing, 5 tree derived clones from 1943 H.P. Seedlings

Tapped S/2, d/3, 67%. Yield in gms d.r.c. per tree per tapping June-December, 1953

Clone	Seedling Mother tree family	Yield	Clone	Seedling Mother tree family	Yield
RLD53	PB86×RLD8	43.1	RR301	PB86×MK3/2	25.6
RLD55	PB86×WG6278	42.1	RR299	,, ,,	26.7
RLD54	PB86×WG6278	33.2	RR257	PB86×RLD8	26.0
RLD57	PB86×RLD8	33.1	RR252	,, ,,	27.9
RR260	,, ,,	30.0	RR212	,, ,,	21.7
RR241	,, ,,	30.4	RR229	,, ,,	21.1
RR211	,, ,,	30.3	RR206	,, ,,	21.9
RR240	,, ,,	29.7	RR218	,, ,,	23.2
RR224	,, ,,	29.1	RR208	,, ,,	23.9
RR283	PB86×WG6278	29.0	RR231	,, ,,	21.8
RLD56	,, ,,	32.1	RR232	,, ,,	21.0
RR258	PB86×RLD8	29.5	RR304	PB86×MK3/2	21.5
RR237	,, ,,	24.1	RR274	PB86×WG6278	21.4
RR220	,, ,,	26.4	RR296	PB86×MK3/2	23.7
RR261	,, ,,	24.4	RR272	PB86×WG6278	21.8
RR278	PB86×WG6278	25.6	RR263	PB86×RLD8	21.8
RR279	,, ,,	27.1	RR268	PB86×WG6278	22.9

The yield results of the seedling families show that clone PB86 has crossed well with the local clones MK3/2, WG6278 and RLD8. A selection of the best yielding clones will be made for multiplication of budwood and trial on a large scale. Yields of 30 grams per tree per tapping and over for the first tapping year on a 67% intensity are outstanding.

1946 Clearing, Legitimate Seedling Trial, 1944 Hand Pollinated Seedlings

The 1944 seedlings were planted as 2 year old stumps in August 1947 in an area left over from the 1946 clearing. This area was tapped in 1953, and the yield results are summarized in Table XIV. The five tree derived clones established from the 1944 H.P. Seedlings will be tapped in 1954. These clones were planted in the 1947 clearing at Hedigalla.

The PB86 seedling families with a variety of male parent clones again show satisfactory yields for the first tapping year. It would be premature to make a more detailed analysis of clone PB86 as a clonal seed parent at this stage, but this clone has produced promising seedling families in other clearings.

TABLE XIV

1946 Clearing, Legitimate Seedling Families, 1944 Hand Pollinations

Tapped S/2, d/3, 67%. Yield in lbs. d.r.c. per tree per year, 94 tappings.

Family	No. of trees tapped	Yield 1953
PB5/139×TKD113 ...	115—128	5.2
PB86×TKD113 ...	38—39	4.8
PB86×GL1 ...	15	2.7
PB86×BR2 ...	16—20	2.0
PB86×MK3/2 ...	9—10	4.7
PB86×DK5315	4—6	2.2
PB86×BD10 ...	8	3.2
PB86×PIL.B.84 ...	5—6	3.0
PB86×PB5/60	7	2.8
PB86×WG6278	5	3.3
PB86×PB5/139 ...	5	2.8
PB86×HC28 ...	3—4	3.7
PB86×AV163 ...	4	3.5
PB86×PB6/50 ...	3	3.7
PB86×TJ.1 ...	2—3	2.0
TKD113×TJ.1 ...	20—23	4.1
TKD113×RLD5 ...	12—14	5.4
TKD113×GL1 ...	9—10	3.5
TKD113×HC28 ...	1	3.5

1947 Clearing, Legitimate Seedling Trial, 1945 Hand Pollinated Seedlings

This area was planted with 3565 stumped hand pollinated seedlings in October 1947. About 1,300 seedlings were subsequently lost following a

severe drought soon after planting. The Vacant points were supplied with seedlings of clone TJ.1 and PB86 from various sources. The girth measurements at the end of 1953 are summarized in Table XV. This area will be tapped in 1954.

TABLE XV

1947, Clearing, Legitimate Seedling Trial, Hedigalla.

Mean Girth in Inches 1953

Family Cross	No. of trees	Girth	Family Cross	No. of trees	Girth
AV157×AV352	4	17.3	PR520×PB5/139	8	13.8
AV163×AV252	4	16.8	PB5/139×BR2	39	16.9
AV163×BR2	12	16.1	PB5/139×KD2	11	19.2
AV163×RRI519	72	16.7	PB5/139×BD10	4	16.3
AV163×RRI506	186	18.5	PB5/139×PB6/50	4	22.3
AV163×TJ.1	74	17.8	RRI514×PB5/139	23	18.0
AV163×RRI514	22	18.6	PB86×AV163	1	24.4
RRI514×AV163	33	15.9	PB86×RRI519	22	18.4
AV163 "selfed"	4	14.8	PB86×RLD4	54	18.6
BR2×TJ.1	26	15.9	PB86×RLD5	141	20.0
BR2×AV255	21	17.2	PB86×RLD6	63	16.2
BR2×RRI506	119	18.0	PB86×RLD7	263	20.4
BR2×RRI514	23	16.4	PB86×AV255	74	18.8
RRI514×BR2	9	15.8	PB86×AV352	9	18.6
PB5/139×RRI500	32	16.8	PB86×AVI57	44	20.7
PB5/139×RRI501	51	19.8	PB86×PB23	5	20.8
PB5/139×RRI504	79	18.7	PB86×RLD2	1	20.4
PB5/139×RRI506	40	20.3	PB86×PB86	1	14.5
RRI506×PBI/139	4	15.0	TJ.1×RRI514	110	18.0
PB5/139×RRI511	69	18.2	TJ.1×RRI506	94	17.8
PB5/139×RRI513	56	18.4	TJ.1×AV255	67	19.5
PB5/139×RRI518	42	18.2	Supplies PB86 (ill.)	553	18.7
PB5/139×RRI519	61	18.0	,, TJ.1 ,,	262	17.6
PB5/139×RRI520	62	18.2	,, GL.1 ,,	46	16.3

1949 Clearing, Large Scale Clone Trial, with Hedge Planting, 34¾ Acres, Hedigalla.

This area is planted on the "Hedge" planting system with trees spaced 6′ in the rows and 45′ between rows giving approximately 160 planting points per acre. 31 clones are replicated sixfold in 25 tree plots in an incomplete block layout. The area was planted in July, 1949. Girth measurements were taken in January, 1952 and December 1953. The figures are summarized in Table XVI together with the increment figures for approximately 12 months growth.

TABLE XVI

1949 Clearing Large Scale Clone Trial, Hedigalla

Mean Girth in Inches

Clone	Girth December 1953	Increase 12 months	Clone	Girth December 1953	Increase 12 months
RR19	11.6	2.9	RR46	13.1	3.5
RLD52	15.3	4.2	RR48	12.5	3.0
RR29	12.8	3.4	RR49	13.2	3.4
RR30	13.4	3.6	RR50	11.2	2.2
RR31	13.4	3.1	RR51	12.3	2.7
RR32	10.4	3.0	NAB16	10.9	2.9
RR33	14.4	3.9	NAB17	13.1	3.4
RR34	10.9	3.0	NAB20	13.2	3.5
RR35	13.0	3.1	DAR38	12.6	3.0
RR37	12.6	3.2	DAR40	13.2	3.3
RR40	12.4	2.9	RRI501	12.3	3.3
RR41	11.0	2.8	RRI504	12.8	3.0
RR42	13.3	3.2	RRI513	12.3	2.8
RR44	12.0	2.9	PB86	12.8	3.0
RR45	12.1	2.7	PB6/50	14.7	3.5
			LUN.N	11.3	2.8
			Mean	12.6	3.1

For approximately 4½ years growth the mean girth of 12.6 inches is very satisfactory on very hilly land at Hedigalla. Other areas planted normally on square and rectangular systems of planting have given poorer average growth at Hedigalla for the same age. It is interesting to note the outstanding growth of clone RLD52 which is under special observation for Oidium resistance. No wind damage has been reported from this area.

1950 Clearing, Small scale clone trial, 20 acres, Hedigalla.

This clearing opened in 1950 was planted in May-July 1951. Each clone is replicated threefold in plots of 25 trees in three plots of 10 to 11 clones each. The girth measurements were taken in December 1953 and the results are summarized in Tables XVIIA, B. and C. The trees are approximately 2½ years old.

TABLE XVIIA

Experiment 1. (Chaemara Clones)

Planted May 1951, Mean Girth in Inches December, 1953

Clone	CH2	CH3	CH4	CH8	CH26	CH29	CH31	CH32	PB86	LCB 870	Mean
Girth	8.8	9.44	7.70	7.51	9.61	8.68	7.67	9.53	9.07	8.08	8.60

Girth Growth over 9 inches since planting is outstanding.

TABLE XVIIB

Experiment II

Planted, May 1951, Mean Girth in Inches

Clone	Seedling Mother Trees	Girth
DAR34	Illeg. Seedling MK1/1 (DAR)	6.66
RLD13	RLD8 × MK3/2	5.96
RLD15	WG6278 × MK3/2	7.75
141/41N	RLD8 × WG6278 (1941 N'kele)	6.48
154/41N	RLD8 × WG6278 (1941 N'kele)	5.21
RLD10	MK3/2 × WG6278	8.62
RLD9	RLD8 × MK3/2	6.24
PB9/82	—	5.83
LCB870	—	6.78
PB86	—	6.30
Mean		6.58

TABLE XVIIC

Experiment No. 3

Planted in July 1951, Mean Girth in Inches

Clone	Seedling Mother Trees	Girth
RLD11	Pil.A.44 × WG6278	5.52
RLD12	RLD8 × MK3/2	5.78
RLD14	RLD8 × WG6278	6.45
RR38	TKD Seedling No. 73, 1935 N'kele	5.06
RR39	,, ,, 86, ,, ,,	6.48
RR43	TKD ,, ,, 109, ,, ,,	4.22
RR52	PBIG ,, ,, 143, ,, ,,	6.72
RR53	,, ,, 184, ,, ,,	6.94
RR54	,, ,, 197, ,, ,,	6.34
DAR33	Ill. ,, MK1/1 Dar.	6.12
OY1*	—	4.52
PB86	—	6.14
LCB870	—	5.76
Mean	—	5.85

The growth in experiments No.'s 2 and 3 is satisfactory, but not up to normal standards in good replanted areas. The growth of clone OY 1. under local conditions is poor for 2½ years of age, and it is apparently slow to put on girth.

1952 Clearing, 25 Acres, Hedigalla

This area was planted with 645 five tree clones established from the 1945 H.P. seedlings planted in the 1947 clearing. The planting was carried out in October—November 1952. The growth is satisfactory and the clearing has been manured under general estate supervision.

*New clone (Indo China)

1953 New Planting

I. Large Scale Clone Trial 96½ Acres, Hedigalla

A large scale clone trial was planted in the S.W. season of 1953. Each clone was replicated five to sixfold in 200 tree plots, which will later be used as tapping tasks. The following clones were included :—

RRI 501	RLD 1
RRI 513	RLD 2
LCB 1320	RLD 3
LCB 870	RLD 4
WG 6278	RLD 5
MK 3/2	RLD 6
LUN.N	RLD 7

Boundary areas were planted with TJ. 1 clonal seedlings.

II. 1953 Clearing, Seed Garden 14½ Acres, Hedigalla

A seed garden was planted in the S.W. season with selected clones in a layout, which provided maximum facilities for crossing between seed bearers Group A, and male parents Group B under Ceylon conditions of seed production. The following clones were allocated to the two groups :—

Group A—Clones TJ.1, TJ.16, PB5/139, RLD8, WG6278, MK3/2, PR107, LCB1320.

Group B—Clones BR2, PB23, AV163, AV157, AV152, BD10, LUN.N, GL1, DBK1, RRI 501, RRI 504, AV255 and HC28.

Satisfactory isolation belts exist with jungle reservations along main streams.

Tapping Experiments on Outside Estates.

With the appointment of the Plant Breeder in 1953 a start has been made with the test-tapping of hand pollinated material planted by the Institute on outside estates. There are 11 plots of this material located on 9 estates. Each plot consists of a trial of 100 selected seedling crosses from the 1945 H. P. Seedlings. together with 5 tree clones established from these seedlings in an adjacent area, There are, therefore, 600 trees in each trial.

The 100 seedlings are tapped on a per tree basis, and 5 to 10 of the best yielding clones are selected for test tapping. Budwood of the most outstanding clones will be introduced to our nurseries as early as possible for multiplication and large scale trial.

Test-tapping of clones LCB870 on Kepitigalla Estate, Ankumbura.

24 trees of this clone were planted in a clone museum at Kepitigalla for testing against Oidium leaf disease. The plot was planted in 1941 with over 50 other clones. Test-tapping in approximately the 13th year of growth was undertaken in 1953 by the Botanical Department. The results are summarized below together with figures for growth.

This clone has become of increasing importance since it has been demonstrated by the Mycology Department as being resistant to Oidium leaf disease.

Clone	No. of trees	Mean girth in inches 20-3-53	Average yield in grams per tree per tapping Jan. to Dec. 1953	Bark Thickness, 1953	
				Virgin	Renewed 5 years
LCB 870	24	33.4	13.3	6.3	6.0

The clone is not high yielding, and in the Matale district which is dry, a yield of about 600 lbs. dry rubber per year can be expected with a tappable stand of 150 trees per acre. The clone is also definitely thin barked with an average girth of 33.4 inches.

About 70 well grown trees of LCB870 will be available for tapping in 1954-55 on an estate in the wet low-country. Four poorly grown trees at Dartonfield for 9 months tapping in 1953 yielded 18.9 grams per tree per tapping and the indications are that an improvement in yields, compared with those in the Matale district can be expected in the wet low-country districts.

Budwood Nurseries

New RLD clones No.'s 9 to 51 are being multiplied in the budwood nurseries at Nivitigalakele for planting in large scale clone trial of 5 to 6 acres for each clone in 1954, and 1955.

2,833 yards of budwood were issued from the general budwood nurseries at Nivitigalakele to Estates and Small Holdings. Ninety five per cent. of the total issues were from clones PB86, WG6278, PR107, RRI.501, RRI.513, AV255 and LCB870. The last clone has been used mostly for crown-budding.

Planting Material from Malaya

402 budded stumps of 201 clones, representing seedling material of Hevea species from Brazil and Peru, introduced to Malaya by the R.R.I. Malaya, were shipped to the R.R.I. Ceylon. The stumps were received 6 days after despatch and planted at Dartonfield on 18-6-53. The planting results at the end of 1953 were as follows :—

	No. of clones planted	No. of clones surviving	Total No. of plants
Hevea braziliensis (Brazil) ..	14	13	24
Hevea benthamiana (Brazil) ..	65	65	124
Hevea braziliensis (Peru) ..	122	120	209
Total ..	201	198	357

Hand Pollination Programme 1953

The pollination programme for 1953 was carried out by the newly appointed Plant Breeding Officer under the supervision of the Botanist. The results are summarized below. A number of new high yielding RLD clones were used in the crosses, some of these represent "sibs" and "half-sibs". The LCB.870 crosses were carried out on behalf of the Mycology Department in connexion with its Oidium resistance breeding programme.

Seed parent	Pollen Parents	No. of Pollinations	Sets	Wind Damage	Fruits harvested	No. of plants in nursery
LCB 870	MK3/2, WG6278, PB23 BD10, BR2, PB86 Glen. 1 TJ.1, PR107 LCB870, & RLD8, 36, 37, 38, 9	5084	1173	314	859	2069
MK 3/2	AV255, PR107, LCB1320 RLD8, NAB20	1069	18	4	14	31
PR 107	AV255, NAB20, LCB1320, WG6278	690	16	2	14	30
BR2	RRI501, Glen. 1	64	21	13	8	20
TJ. 1	RRI501, AV157	214	—	—	—	—
RLD9	MK3/2, RLD10, RLD51	719	6	3	3	7
RLD36	WG6278, RLD4, 6, 50	242	11	—	11	32
RLD37	WG6278, RLD5, 6	141	14	1	13	36
RLD38	WG6278, RLD6, 50	348	23	4	19	25
RLD50	RRI501, WG6278, RLD6, 36	1157	—	—	—	—
RLD56	WG6278, LCB870, RLD8	261	2	1	1	2
	Total	9989	1284	342	942	2252

Crosses between closely related parents

Relationship	Family	No. Pollinations	No. Sets
Sib	RLD9 × RLD51	127	3
½Sib	RLD9 × RLD10	325	2
,,	RLD36 × RLD50	156	3
,,	RLD38 × RLD50	126	1
Back cross	RLD9 × MK3/2	157	1
		891	10

REPORT OF THE MYCOLOGY DEPARTMENT FOR THE YEAR 1953

By

J. H. VAN EMDEN

SUMMARY

The main feature of 1953 was as far as the mycological department was concerned the very light incidence of Oidium which resulted in a good canopy of leaves in most rubber districts.

The work of the department was concerned mainly with the problem of control of *Oidium heveae*.

Field experiments showed the superiority of liquid spraying as a means of control as compared to dusting. The experiments also demonstrated the great difficulties which are to be anticipated if an attempt is to be made to establish wet treatment as an estate routine.

It is suggested that the problems of disease control be kept in mind when making new rubber clearings and that the fields be planned accordingly. The problem of spray application should however remain the object of further study, while simultaneously every attempt should be made to improve the efficacy of the dusting method.

Except for Oidium, diseases did not cause serious concern. Treatment of Fomes appears to have become routine practice. One case of secondary leaf-fall presumably due to Gloeosporium was seen and a few cases of Phytophthora leaf fall were reported. In the nurseries Bird's eye spot (Helminthosporium) was very common but not serious enough to cause the plants to stagnate in growth. A number of cases of sun-scald in young nurseries came to our attention. For cover crops the year was not very favourable. The denser canopy of rubber foliage considerably reduced the light reaching the cover crops. Several diseases were prevalent. In Pueraria much damage was done arly in the year by the caterpillars of Lamprosema spec. In Desmodium borers were rather active while also a new disease was found, the pathogen of which has not yet been identified.

1. Staff.

The Mycologist was on duty throughout the year and also acted for the Director during his absence on leave, from June 9th till September 11th.

The Acting Assistant Mycologist returned from Canada on September 21st after a two year period of training in plant pathology at MacGill University on a technical aid scholarship and was appointed Assistant Mycologist as from 17th December 1953.

Mr. M. D. David's employment as laboratory assistant terminated on July 31.

Mr. H. L. Munasinghe was appointed laboratory assistant on 1st September 1953 and Mr. E. G. Mendis was appointed in the same designation on 1st November.

2. General.

Extension work of the laboratory planned in 1952 was started in September and continued throughout the year. On account of this virtually no laboratory work could be done during the last four months of the year.

The Mycologist attended four district P. A. meetings.

On November 16th a paper "Oidium Control and Replanting" was read at the Rubber Conference in Colombo.

Lectures were given to the Morawak Korale P. A. and the Kalutara P. A. on the subject of Oidium control.

54 visits to estates (other than R.R.I.) were made.
Correspondence : 736 Inward 500 outward.
Samples of diseased material examined : 45
Samples of sulphur analysed : 16

3. OIDIUM

3. 1. **Climate**—According to R.R.I. records, the rainfall for the year amounted to 145.48 inches, which is about 20 inches below average.

Distribution of the rainfall was abnormal. March was wetter than usual, whereas April and May were exceptionally dry. July however showed about three times the normal rainfall.

	1953	Average
January	3.75	7.52
February	5.12	5.52
March	16.21	10.10
April	10.10	13.36
May	6.04	26.92
June	6.07	17.44
July	33.80	12.67
August	6.62	11.04
September	7.54	13.36
October	20.43	18.79
November	17.87	18.55
December	11.93	10.58
Total	145.48	165.85

3.2. **General observations.** Most rubber wintered in the latter part of January and refoliation took place early in February. In most rubber districts the first three weeks of February were dry, without the small showers so often occurring at that time of the year. The consensus of opinion amongst planters is, that this coincidence of refoliation and a dry period accounts for the mild Oidium season generally experienced. Exceptions were Galle and Ratnapura, where mildew was not exceptionaly mild; in those districts the drought was also less marked than in most other areas.

3.3. **Sulphur.** Sulphur of good quality was generally available. During the first months of the year the price was between Rs. 900 and Rs. 1200 per ton, but later in the year the price dropped to a level between Rs. 600 and Rs. 800 per ton.

From a firm in New Zealand two lots of dusting sulphur of narrow and specified particle size ranges were purchased for field experiments, whereas large samples of various kinds of "modified sulphur" preparations were placed at our disposal for field testing.

3.4. 1. Experiments carried out in the 1953 season.

Experiment No. 1

Clone BD. 5

Altitude less than 100 ft. above sea level.

Comparison of: (*a*) yellow sulphur of standard specifications at 12/lb/acre/week.

(*b*) industrial sulphur containing about 45% elemental sulphur; 90% passing 325 mesh A.S.T.M.

(*c*) no treatment.

Result.—The experiment was assessed by counting of fallen leaves.

	Treatment (*a*)	Treatment (*b*)	Treatment (*c*)
1st count ..	17.5 leaves/sq. yard	38	120
2nd count ..	43.5	61	161
	61	99	281

The first count was made on the day of the last treatment.

The second count was made two weeks later.

Experiment No. 2

Clone BD5

Altitude: Less than 100 ft. above sea level.

Comparison of: (*a*) wettable sulphur at a rate of $2\frac{1}{2}$ lbs. elemental sulphur/acre/week;

(*b*) wettable sulphur at a rate of $1\frac{1}{4}$ lbs. elemental sulphur/acre/week;

(*c*) dusting sulphur of standard specifications 12 lbs./acre/week;

(*d*) no treatment.

In this experiment there was very little leaf-fall and results had to be assessed by collecting leaves and classifying those according to the apparent severity of Oidium infection.

For this purpose the following classes were used:

(1) Leaves without Oidium spots.

(2) Leaves with only a few spots.

(3) Leaves showing light spotting.

(4) Leaves showing heavy spotting.

(5) Leaves incomplete due to loss of one or more leaflets.

Result:

Class	Number of leaves in each class			
	a	b	c	d
1	67	21	—	—
2	125	87	39	10
3	313	225	356	172
4	429	483	419	567
5	66	184	186	251
	1000	1000	1000	1000

The samples were taken from stem shoots, which due to their sheltered position, are more prone to Oidium than leaves from the crown.

The treated plots had a healthier appearance, being greener and bearing larger leaves.

The difference in appearance was maintained throughout the year and became even more evident towards the end of the year. The untreated plots and the dusted plots had already lost most of their foliage before wintering started in the plots treated with wettable sulphur (see figure 1-2-3).

Experiment No. 3

Clone Pil. B. 84,

Altitude : About 300 ft. above sea level.

Comparison of (*a*) treated with wettable sulphur (w) at a rate of 4½ lbs. elemental sulphur/acre/week.

(*b*) No treatment.

Assessment. In this experiment there was moderate leaf fall but the terrain was very unfavourable for counting ; hence the method of assessing the degree of defoliation of trees was adopted.

Result :	a	b
Average leaf fall	less than 5%	30—35%

In this experiment too a striking difference in general appearance was maintained throughout the year and here again symptoms of wintering began in the untreated plots about 4—6 weeks ahead of the treated plots.

Experiment No. 4

Clone TJ. 16

Altitude : About 500 ft. above sea level.

Comparison of (*a*) wettable sulphur at a rate of 3 lbs. elemental sulphur/acre/week.

(*b*) wettable sulphur at a rate of 1¼ lb. of elemental sulphur/acre/week.

(*c*) No treatment.

Assessment of results by estimating leaf fall.

Result	a	b	c
Average leaf fall	15—20%	15—20%	35—40%

In this case obviously too little sulphur was used. The wettable sulphur used for treatment " a " was a sample sent to us for trial and it was found to be inferior to the other kinds used in as much as it did not remain in suspension but settled very rapidly.

Experiment No. 5

Clone TJ. 1

Altitude 700 ft. above sea level.

Comparison (*a*) Yellow sulphur of standard specification
(*b*) Industrial sulphur
(*c*) Redispersible sulphur } Dusting
(*d*) No treatment

Assessment by estimating the leaf fall on 50 sample trees in each plot. In this case the following symbols were used.

0 for trees showing no signs of Oidium
1 ,, with Oidium spotting but without leaf fall.
2 ,, with less than 10% leaf fall.
3 ,, with more than 10% but less than 33% leaf fall.
4 ,, with more than 33% but less than 67% leaf fall.
5 ,, with more than 67% leaf fall.

Result . Average total of points for 50 trees.

a	b	c	d
179	176	191	193

The result of all treatments in this experiment must be classed as a failure and the experiment indicates that at this altitude 12 lbs. sulphur/acre/week gives no adequate protection on a susceptible clone.

Experiment No. 6

Polyclone area

Altitude : sea level

Comparison (*a*) Lime sulphur 1½ gallons per acre made up to 4½ gallons with water once a week for five rounds.

(*b*) No treatment

Assessment

The treated area showed virtually no leaf fall whereas defoliation in the untreated plots was about 50%. The difference in foliage was maintained throughout the year.

Experiment No. 7

Clone TJ. 1

Altitude less than 100 ft. above sea level.

Comparison of (*a*) wettable sulphur 3 lbs.
lime sulphur 6 ozs. } per acre per week.
white oil emulsion 6 oz.

(*b*) Yellow dusting sulphur 9 lb./acre/week.

(*c*) Yellow dusting sulphur 9 lb./acre, twice a week.

(*d*) no treatment.

Assessment

Leaf fall was light in this area. The sprayed plots showed, greener healthier appearance than either the dusted and the untreated plots. Yields were taken but do not show a higher yield for the treated plots.

Yields from March 15th to November 30th expressed as a percentage of the yield for the same plots over a period of four months prior to treatment :

a	:	190	c	:	183
b	:	169	d	:	189

3.4.2. **Observations and conclusions**—In the experiments described above, various methods of assessing the results were used. Although improvement in yield will always be the final criterion, comparison of crop is not a suitable means to arrive at a conclusion regarding the phytosanitary value of a treatment on a plantation which has been subject to Oidium for a number of years, as it was found, that although striking differences in foliage could be seen, the differences in yield for the first nine months after wintering were negligible.

A possible explanation is, firstly, that a root system which was matched to a poor crown, needs time to adapt itself to a larger crown and secondly that the laticiferous part of the bark, which consists of tissues of increasing age, is partly made up out of tissues which were formed under unfavourable conditions.

If this explanation is correct, it follows, that Oidium control experiments will have to be carried out for a number of years if one wishes to investigate the economical aspect of the problem. For the purpose of obtaining a quick indication of the efficacy of the various treatments, counting of the number of leaves collected on certain sample areas during a certain time interval appears to be the most accurate method, but is difficult to carry out in large experiments. Next best is considered to be the collection of leaves from sample trees and grading of same in the laboratory according to the degree of Oidium spotting present. The least accurate method, but the easiest to carry out, is assessment of the degree of defoliation of a certain proportion of the trees in each plot. The subjective element in this method can be more or less eliminated by having the assessment done by people not familiar with the layout of the experiment.

Of the treatments tried in the field, the standard recommendation of dusting at a rate of twelve pounds per acre with one week interval for 5 weeks, proved to give a certain degree of protection in three out of four experiments, but in none complete protection was achieved. In the fourth experiment, on a rather susceptible clone at about 800 feet above sealevel, sulphur dusting according to the above specifications was a failure ; this result is confirmed by observations made on several estates. On susceptible clones and if conditions are favourable for Oidium, either the rate of application will have to be increased or the frequency of dusting will have to be stepped up. Under dry weather conditions a heavier rate of application will probably be the most practical solution, whereas under showery conditions a closer spacing of the rounds seems to be indicated. Treatment with wettable sulphur was more successful than the dry treatment. Application of liquid sprays is however much more costly than application of dusts.

Application of lime sulphur stimulated flowering of the rubber trees. Wettable sulphur had the same effect, but to a lesser degree. Another

auxiliary effect of sulphur appears to be a delay in wintering. This delay was most marked in the plots treated with a wettable sulphur. In the trees which were sprayed with sulphur, leaves were larger and showed a deeper green colour.

The above observations indicate that sulphur is absorbed by the foliage and has physiological effects apart from its fungicidal action.

The results obtained with spraying (as opposed to dusting) have been so encouraging that the problem of spray application deserves a great deal of attention. Costs of spraying could be reduced by giving the problem due consideration at the time of replanting for example by adopting a system of avenue planting and making provisions for roads.

With the improved dusting machinery now available dusting can be considered as a very easy and cheap way of applying fungicides and the problem of how to make dusting more effective, should certainly be investigated.

Improvement of Oidium control by dusting methods may be possible by:

(a) using more sulphur per acre, either by using more per round or by spacing the rounds more closely ;

(b) using sulphur powders of uniform and effective particle size ;

(c) by addition of dust-stickers to the sulphur powder ;

(d) by using so called ''redispersible'' sulphur powders. (These are really wettable sulphur preparations in such a state that they can be applied as a dust, but act as wettable sulphurs when they come in contact with water);

(e) by using newer fungicides such as for example:

Phenyl mercury chloride dust
Dinitrocaprylphenylcrotonate
Copper naphtenate absorbed in clay.

Examination of most of these possibilities will be commenced in 1954.

Sulphur Dusting Machinery.

In 1953 some vastly improved dusting machines came on the market. The well known Noidium duster appeared in a more powerful but much lighter form. The present model weighs only 110 lbs. The ''Whirlwind'' manufacturers introduced a smaller and lighter model under the name Junior Whirlwind, which is still powerful enough for most rubber plantations.

The new Noidium and Whirlwind machines are well known and apart from the technical data given in the table below, they need no fu ther description.

The Dustejecta also appeared in a modernised version. This machine shows an attempt to achieve agitation of the dust in the hopper, by means of air derived from the fan chamber.

Entirely new appearances on the Ceylon market are the Mistral IIA, the ''Pomonax'' and the ''Toxaver'' machines.

Of the ''Pomonax'' and ''Toxaver'' machines only proto-types were seen which although very promising need some modification.

The Mistral IIA of which a prototype was tested early in the year appeared as a production model and this machine has many highly desirable characteristics, of which the system of agitation of the dust in the hopper deserves, special mention. Agitation is, next to the reduction of weight the greatest improvement encountered in the new dusting machinery. Agitation is also found in the Pomonax and the Toxaver. The two stroke engine made its re-appearance in the Dustejecta, and the Pominax.

Technical data on dusting machines now available:

	Noidium	Dustejecta	Whirl-wind	Mistral IIA	Pomonax	Toxaver
Engine. Make	Villiers Mk12	Villiers	J.A.P.	Briggs & Stratten	Fichtel & Sacks	Villiers
Type	Four stroke	Two stroke	Four stroke	Four stroke	Two stroke	Four stroke
H.P.	1.2 h.p. at 2400 r.p.m.	1.15 at 2500 r.m.p.	1.2 h.p.	2-2.5 2800-3200 r.p.m.	2-2½ h.p. at 3000 r.p.m.	1.15 at 2500 r.p.m.
Weight Empty	110	140 lb.	99 lb.	72	72	*
Hopper capacity	40	60 lb.	30-40 lb.	50	50	*
Output (approx.)	0-8 lb./min.	0-5 lb./min.	0-20 lb./min.	0-4 lb./min.	0-3½ lb./min.	*
Air velocity at outlet	90 m.p.h.	*	75 m.p.h.	†	*	*
Air volume discharged	980 ft/ min.	*	*	†	*	*
Agitator	Not fitted	by air	Not fitted	Fitted. very effetcive	Fitted, very effective	Fitted

* not known
† publication not permitted

Spraying Machinery

The Micron sprayer (orchard sprayer) purchased in 1952 gave good service during the 1953 season. On flat land it was possible to spray between 5 and 6 acres of rubber per hour. The results of the spraying trials show beyond doubt that the machine is capable of throwing the spray to the height of average budded rubber, but due to the fact that the machine requires a path at every other row, it cannot be considered a practical proposition for the average Ceylon rubber plantation.

On flat land and in contour planted rubber the machine would certainly be useful.

A new model of the Micron sprayer, the so called '' Plantation Sprayer '' was seen, this model is virtually an orchard sprayer in which the undercart and the gear pump have been removed while the size of the tank is reduced to 5 gallons. Consequently the weight has been brought down to less than 200 lbs. instead of 560 lbs. Since the power unit and the fan have remained unchanged the performance should be the same as of the '' orchard '' sprayer and since it is portable, the '' plantation '' micro sprayer is a much more practical proposition than its predecessor and may prove to be a step towards solving the problem of spray application in existing rubber plantations.

Mistejecta

A '' Mistejecta '' machine, made by Messrs. Drake & Fletcher was loaned to the R.R.I. by the Agents, Messrs. Harrison Lister. This machine, which consists of a blower unit and an engine unit which can be quickly assembled was primarily designed for control of Phytophthora leaf blight in South India. It is meant to be operated stationary ; after spraying the surrounding trees, the machine is to be carried by manpower to its next position.

Since this system is not considered practical for Ceylon conditions the machine was mounted on a trailer and operated from main roads.

The machine is powered by a Ford 10 h.p. water-cooled engine and the blower consists of a 27 inch diameter four bladed axial flow fan. Under normal spraying conditions the spray easily reaches the tops of the highest rubber trees, and although the machine cannot be considered a practical proposition for the average Ceylon plantation, due to its weight and size, it might be very useful on flat land and in contour planted rubber. In a contour planted field, say 5×50 ft. one road every 100 ft. would be sufficient since this sprayer would be powerful enough to spray in two directions even if there were a slight movement of air.

The present Mistejecta is looked upon by the R.R.I. as a prototype requiring a number of improvements for which suggestions will be put before the makers.

Biatom III

A Biatom III, made by Messrs Birchmeier of Switzerland was loaned to the Institute by the agents Messrs Baur & Co. This machine which is no longer a prototype but a production model has not yet been used but appears very promising.

Again the weight of the machine will restrict it to main cart roads.

3.8. Aerial Spraying

Messrs Pest Control of Cambridge, U.K. contracted to spray about 3000 acres of rubber in Ceylon.

Five rounds of spraying will be carried out at a price of Rs. 100 per acre inclusive of chemicals.

The R.R.I. cooperates in this "experimental contract" in an advisory capacity.

3.9. Breeding for Resistance

The seedlings resulting from 1951 pollinations are growing in the field in a 3.75 acre clearing where they have been planted at 5×20 ft. Observations were made on growth and incidence of Oidium. It seems that vigorous growers are more susceptible to Oidium than poor growers. There are a few promising plants.

1952 Pollinations—These are still in the nursery ; in the past Oidium season, mildew appeared only in a very light degree in this nursery. Bird's eye was however serious.

In 1953 the following pollinations were made by the Botanical Department :

At Kepitigalla	Female parent	LCB.870	
	Male parent	BR2	412
		PB86	279
		TJ.1	282
		GL.1	333
		MK3/2	527
		PR107	410
		RRI16	13
		26/10	15
		LCB870	313
		Total	2584
	Male parent	LCB870	
	Female parent	BR2	102
At Dartonfield	Female parent	LCB870	
	Male parent	MK3/2	349
		BS3	271
		PB23	290
		WG6278	113
		BD10	202
		LCB870	205
		Total	1405
At Hedigalla	Female parent	LCB870	
	Male parent	PB6/5	12
		7/16	76
		WG6278	119
		PBS	90
		30/7	3
		Total	230

Male parent	LCB870		
Female parent	30/10		164
	30/23		230
	7/16		64
	RR28		245
	11/3		5
			608
Total with LCB. 870 as a female parent		4244	
„ „ „ male parent		810	
		5054	

3.10 **Crown Budding**

3.10.1. **Twinned seedling experiment at Hedigalla.** This experiment was test tapped according to the Morris-Mann system in order to investigate whether there is any indication of a depressing effect on the yielding capacity of the trees which have been crown budded with LCB870.

The total yield obtained from all trees crown budded with LCB870 was a few grammes higher than the total yield of their twins crown budded with TJ.1. This difference is however well within the range of normal variations and no importance should be attached to it.

It is however rather important that at this stage no depressing effect by a relatively low yielding crown could be demonstrated.

3.10.2. **Experiment on Kepitigalla.** In this experiment three groups of 200 plants out of 3 separate clearings were crown budded with LCB.870. Comparison of girth measurements of the crown budded plants with the comparable plants which were left unbudded indicates that the crown budded plants may be expected to come into tapping one year later than they would have, had no crown budding been done.

4. Diseases other than Oidium

4.1. **Leaf fall presumably due to Gloeosporium spec.**—On one estate in the Kalutara district serious leaf fall occurred in TJ.16 and PBIGS. Mature leaves were affected and it is estimated that about 25% of the leaves in the area were lost.

On all fallen leaves large numbers of Gloeosporium spec. acervuli could be found while Collectotrichum spec. was also generally present.

Inoculation with spore suspensions from pure cultures of both fungi failed however to cause the symptoms observed in the field.

4.2. **Fomes lignosus.**—Although Fomes is very common in nurseries and plantations of all ages only one sample was received.

4.3. **Corticium salmonicolor.** Pink disease was much more frequent than in the previous year, presumably due to the abundant rainfall in the second half of the year.

4.4. **Sunscorch**—Several samples of sunscorch on young nursery plants were received.

4.5. **Bird's eye spot.** Helminthosporium was very common in most nurseries and caused deformation of leaves and in severe cases leaf fall. The fact that a light shade will reduce the incidence of this disease considerably could be observed on several occasions.

Although the affected nurseries do not show much stagnation in development it may be worthwhile to investigate the use of shade trees in rubber nurseries as a general practice.

Promising shade trees are thought to be **Sesbania grandiflora**, **Leucaena glauca** and **Albizzia falcata (A. moluccana)**, if uprooted within a few years from planting.

5. Cover crops

5.1. **Pueraria phaseoloides.** During February, March and April considerable damage was done by the caterpillars of Lamprosema spec.

5.2. **Desmodium ovalifolium.** Borers (Xyleborus spec.) was wide spread and caused considerable damage.

Unidentified disease. From an estate in the Nivitigala area sample of diseased Desmodium plants was received, which showed swollen stems, short internodes and small leaves.

The disease has now also been found in the Ingiriya area and in the vicinity of Dartonfield. The plants are not killed and the disease is not readily transmitted or alternatively, the incubation period is rather long.

REPORT OF THE AGRONOMY DEPARTMENT FOR THE YEAR 1953

By

D. H. CONSTABLE

Summary

With the lack of laboratory staff (analysts) after Mr. Jeevaratnam's departure it was decided to concentrate on foliar analysis of Hevea with the manurial experiments on estates as the primary objects of study. This has been done but it has been found possible also to study deficiency symptoms occurring on a number of estates. Twelve estates have thus been studied, some of them more than once. We have two types of deficiency exhibited so far, the first apparently of Potash and secondarily of Nitrogen, while the second has not yet been satisfactorily identified.

We have continued the manurial experiments on commercial estates, and on our own, putting into practice our recommendation to manure four times a year. Girth figures have been obtained from the commercial estates and show a response to manuring on six out of the eight estates.

A chemical weed control experiment intended to evaluate to economics of the methods was planned for August. Unfortunately the weather was continuously rainy from the belated start of the South-West Monsoon in July until October-November when the imminence of the North East Monsoon made it necessary finally to postpone the trial till the dry season of 1954.

An advisory tour of the Ratnapura District was undertaken in January at the request of the Sabaragamuwa P. A. culminating in a lecture to that body on the general problems facing the district.

A number of lectures were delivered to other District P. A.'s and to the General Committee of the P. A. of Ceylon to explain our view point on manuring and to answer criticisms on it. A new advisory circular on this subject was issued after we had evaluated planting opinion on our recommendations.

Revisionary work was also carried out on other advisory circulars.

In November a paper on the "Diagnosis of Manurial Requirements of Hevea" was presented at the Conference of the R.R.I.C. and the Rubber Industry.

Amongst the miscellaneous trials carried out was one of Chlordane against the Red, Tree Nesting, Ant and one to check the soil acidity arising from Sulphur Dusting.

During the latter part of the year a (hand) punched card system was adopted for recording of data and for references.

Since August the Laboratory work has been somewhat hampered by the building operations. These have necessitated the partial evacuation of the main laboratory and the concentration of delicate work in the Assistant's Room owing to the dust etc. flying about.

Staff.

Mr. A. J. Jeevaratnam proceeded to Australia at short notice in January of this year to follow a course in Agricultural and Soil Chemistry at the University of Adelaide and the Waite Institute.

There have been no other changes in staff.

The addition of a further laboratory assistant and an attendant were approved by the Board for 1954 and a candidate has been selected, to fill the first post, after competitive interview.

Laboratory Work

During the year approximately 560 leaf samples have been collected and analysed for N, P, K, Ca and Mg and in some cases Fe and Mn. Of these 100 were from areas showing deficiency symptoms and the remainder from our various manuring experiments.

The results from this work will be published in detail in the Quarterly or other appropriate Journal. Table I gives a summary of results for the different nutrients.

It will be seen that the optimum for Nitrogen lies between 3.0 and 3.5%. There is no reason to suspect Phosphate deficiency as the deficient cases noted can all be accounted for in the analysis of one of the other elements. For Potash a value below 0.50% is unsatisfactory and it looks as if values above about 1.0% are suspect. This latter is due to Magnesium antagonism induced by high Potash contents. With Magnesium 0.10% is obviously the lower limit while the highest values also appear suspect. This again is an antagonism, with Potash as the element suffering in this case.

Except in three cases we have not, as yet, had field results to confirm these findings, but experiments are under way in which the (apparently) deficient element is being applied and the state of the leaves kept under observation.

In one area, diagnosed as a Potash/Nitrogen shortage by laboratory work, manuring with Potash and Nitrogen has caused a broad green streak to appear in a "yellow" area and has brought the foliar values back to normal. Further outbreaks of the same trouble have occurred on other areas in this estate and are being treated similarly. Insufficient time has elapsed so far for any more results to be manifest.

The experiment has therefore been extended on this estate and recommended to a number of others in which similar deductions have been made from laboratory figures.

On a second estate with similar symptoms and diagnosis heavy and frequent applications of R 4: 6: 5 have been given on our advice and the Superintendent reports the disappearance of the abnormal leaf colouring.

A third estate with the same symptoms had been manured for some years with Saphos (Rock Phosphate) only. The use of R 4: 6: 5 in small frequent doses on several blocks was advised and appears to have cured the visual symptoms. The Potassium leaf content has risen from 0.20% to 0.70% and Nitrogen from 2.0% to 2.75%. The last figure is not entirely satisfactory. We have asked the estate concerned to continue the treatments for a further six months.

The methods of analysis in use remain much as last year. Leaf samples are now collected in "Alkathene" bags and transported to the laboratory where they are cut, dried in a vacuum oven at 100°C and powdered in a mortar. Nitrogen is determined by Kjeldahl digestion, microdistillation, and titration according to Winkler and others. A sufficiently large sample for the remaining elements is digested with nitric and perchloric acid taking the solutions almost to dryness. This latter is desirable to remove free acid and make buffering the solution simple and less wasteful of alkalies. Complete dryness is avoided because of the danger of driving off Potassium and Phosphorus. Sulphuric acid digestion has been dropped because it does not appear to confer any advantages and because the presence of sulphates particularly Calcium Sulphate is not a help to analysis.

Potassium is determined by flame spectrophotometry. Phosphorus by Phospho vanado-molybdate, Iron by Thioglycollic acid and Manganese by oxidation to Permanganate, all spectrophotometrically. Calcium is by oxalate/permanganate titration and Calcium plus Magnesium by Disodium dihydrogen ethylene diamine tetra-acetic Acid ("Versene" or "Complexone") with F 241 as indicator. Attempts have been made to determine Calcium with the same reagent using Murexide as an indicator, and Magnesium in the filtrate from the Calcium determination.

In the former it has so far not been possible to get a really good colour change and in the latter the presence of oxalate ion appears to interfere even after oxidation with bromine water or hydrogen peroxide. Further work is proceeding on this. At the same time the amount of plant material digested is being increased in order to bring the Magnesium content of the digestate within the satisfactory range of flame photometry. This latter is complicated by the high background values for the water in flame spectrum below 400 millimicrons which causes a comparative lack of contrast of the Magnesium emission at low concentrations. Preliminary tests suggest that a concentration of one gram by leaf material per ten millilitres digested solution will give a satisfactory range of concentrations, permitting clear definition of deficiency levels.

TABLE I

Nutrient Contents as percentages oven dry leaf

Nitrogen

	Below 2.5%	2.5-3.0%	3.0-3.5%	3.5-4.0%	Above 4.0%
Number of samples each from a different estate	2	10	13	12	8
Deficiency Symptoms (not necessarily N)	2	10	6	3	1

Phosphorus

	Below 0.10%	0.10-0.15%	0.15-0.20%	0.20-0.25%	Above 0.25%
Number of samples each from a different estate	0	4	31	8	2
Deficiency Symptoms (not necessarily P)	0	0	14	6	2

Potassium

	Below 0.25%	0.25-0.50%	0.50-0.75%	0.75-1.0%	Above 1.0%
Number of samples each from a different estate	4	8	15	14	5
Deficiency symptoms (not necessarily K)	4	7	2	5	4

Magnesium

	Below 0.05%	0.05-0.10%	0.10-0.15%	0.15-0.20%	Above 0.20%
Number of samples each from a different estate	2	10	2	9	18
Deficiency symptoms (not necessarily Mg)	2	6*	0	5	9

Calcium

	Below 0.5%	0.5-1.0%	1.0-1.5%	Above 1.5%
Number of Samples each from a different estate	3	30	14	4
Deficiency symptoms (not necessarily Ca)	0	8	11	4

* **Note:**—deficiency symptoms developing on remaining four.

A note on the collecting bags may be of use to others working in the same field. "Alkathene" (I.C.I.Ltd.) is available as seamless tubes in widths (laid flat) of 3" to 36" and in any length. It is cut to the required bag length and sealed (at one end) by enclosing in greaseproof paper and drawing a warm soldering iron (pencil bit) slowly across it. The resulting bags fold or roll into very small compass and are waterproof and thus useful for carrying tools also. Marking is easy with a glass marking pencil.

A hand punched card system has been installed for general use and has been applied to the recording of data. Three row punching is used. Edge punching has been found particularly useful for indicating the levels (by classes as in Table I) of each nutrient in a set of samples. Arrangement of cards in order of levels of any one nutrient permits a quick visual verification of correlations with any other nutrient from the distribution of the latter's punchings. Using this method a Potassium-Magnesium antagonism is quite clear in our work.

The data cards are also punched, using mainly the inner rows, for Districts, Estates, Date of Sampling, Clone, Soil pH, reason for sampling, and measurements made. A separate set of cards is being used for literature reference purposes.

Field Work

The following experiments are under observation :

Dartonfield—NPK trial, Hedigalla—Clone/Spacing Trial and Clone/NPK trial, Mirishena, Ambatenne, Epping Forest, Hewagam, Degalessa, Ederapolla, Kepitigalla and Lochnagar—Manurial experiments.

Opata, Niriella, Matugama, Annasigalla, Mirishena, Lavant, South Charley Mount, Dartonfield, Palmgarden, Paiyagalla and Perth—Deficiency experiments.

The Dartonfield 19½ acres NPK experiment proceeded as normally except that we switched to approximately the R. 4: 6: 5 mixture and applications in March, May, August and October. During the year the Empire Journal of Experimental Agriculture published a paper by Constable and Hodnett (Colonial Office Statistician, Rothamstead Experimental Station) reviewing the progress of this experiment up to 1951 and detailing the conclusions to be drawn. A review of this paper has been written and is in print to appear in the next Quarterly Circular. It contains also the figures and results for 1952. The results for 1953 are shown in Tables 2 and 3. As previously the yield has been calculated by taking the average yield for the year given by the commercial tapping of the entire 19½ acres and allocating it to plots in the proportion of their sample totals, one sample yield per month having been taken on each plot.

TABLE 2

Average Girths on each plot 1939 - 19½ Acre Clearing — NPK Experiment in inches

	TJ.1	PB.183	HC.28	PB.86	PB.186	Average
O ..	25.7	24.0	27.2	24.6	23.0	24.9
N ..	23.9	25.2	27.5	26.7	28.5	26.4
P ..	28.5	30.4	29.3	30.5	26.5	29.0
K ..	22.0	24.6	30.3	26.0	21.3	24.8
NP ..	28.4	28.8	30.3	28.5	29.5	29.1
NK ..	26.3	25.0	29.6	27.3	31.5	27.9
PK ..	27.3	30.3	31.8	27.2	28.2	29.0
NPK ..	27.0	28.6	32.8	30.7	29.3	29.7
Compost ..	30.6	30.3	30.7	31.1	32.0	30.9
Average ..	26.6	27.5	29.9	28.0	27.7	

Order of Merit		Fertiliser Effects	
Compost ..	30.9″ ± .79	N_0	26.9″ ± .40
NPK ..	29.7″	N_1	28.3″
NP ..	29.1″		
P ..	29.0″	P_0	26.0″
PK ..	29.0″	P_1	29.2″
NK ..	27.9″		
N ..	26.4″	K_0	27.3″
O ..	24.9″	K_1	27.9″
K ..	24.8″		

TABLE 3

Yields 1953 for the 19½ acres NPK experiment in lbs. per acre (calculated)

	TJ.1	PB.183	HC.28	PB.86	PB.186	Average
O ..	527	454	577	733	447	547
N ..	269	495	423	861	529	515
P ..	898	809	684	996	722	820
K ..	420	363	790	777	535	577
NP ..	840	536	620	955	867	764
NK ..	616	465	767	775	888	702
PK ..	675	844	852	676	830	775
NPK ..	798	499	707	935	742	736
Compost ..	814	1126	550	807	844	828
Average ..	651	621	663	835	712	

Order of Merit		Fertiliser Effects	
Compost ..	828 ± 68 lb. per acre	N_0	680 ± 34 lbs./acre
P ..	820	N_1	680
PK ..	775		
NP ..	764	P_0	585
NPK ..	736	P_1	775
NK ..	702		
K ..	577	K_0	662
O ..	547	K_1	698
N ..	515	N or K	658
		NK	702

From Tables 2 and 3 we see that the previous trend continues, Phosphate manuring is now worth 3.2 inches extra girth, a highly significant value while Nitrogen is worth 1.4 inches, which is quite significant. Compost continues to give the best girth but is not significantly better than NPK or the phosphate containing treatments.

A noticeable point is that TJ.1 has had by far the smallest girth increment which may reflect its unsatisfactory refoliation even under this year's mild Oidium attack.

Considering yields and girths we have now omitted W259 from the Tables owing to the high losses of trees from all plots and the obviously anomalous results arising therefrom.

Again Phosphate manuring is significant with an average improvement of 190 lbs./acre, no other average attaining significance as regards the individual treatments, Compost has risen to the top of the list but is not significantly better than any of the phosphate containing treatments. An interesting point is the manner in which all potash treatments have improved this year particularly relative to nitrogen treatments. This latter result is unlikely to be significant however.

Work on the two Hedigalla experiments has been confined to manuring and to starting the top budding of those plots projected as a PB.86 centre section top budded LCB.870.

It was decided that the top budded plots in both experiments could be used as a check on the zone of influence of the top budded clone. To this end, on the clonal/spacing trial, the buds have been placed at 4½, 6 and 8 feet strictly in order going down each row. The clonal/manuring trial layout only permitted two budding heights, so 5 and 8 feet are used and alternate rows are budded at each height.

An approximate total of 920 PB.86 trees are to be top budded with LCB.870 in the two trials and compared with an equal number of PB.86 and of LCB.870, normally budded stumps.

The commercial estate manurial trials have proceeded satisfactorily with the exception of Hewagam. Manuring is done four times a year, the quantities per application per tree being: Sulphate of Ammonia ½ chundu (5 ozs.) Saphos Phosphate ½ chundu (4 ozs.), Muriate of Potash 50% ¼ chundu (2 ozs.) This contains proportionately a little more Sulphate of Ammonia than is recommended in the R 4 : 6 : 5 : mixture, but is used because the "chundu" measure is universally obtainable and known, and is therefore best for use with unskilled field labour when, as in our case, each fertiliser has to be applied separately. Girth measurements were taken in July and August on all estates and are summarised in Table 4.

TABLE 4

Commercial Estate Manurial Trials.
Average Girths 1953 in inches

	0	P	NP	PK	NPK
Ambatenne ..	10.82″	12.00″	12.46″	11.74″	12.82″
Mirishena ..	3.93	4.41	4.56	4.39	4.84
Epping Forest ..	4.91	5.17	5.36	6.31	6.33
Hewagam ..	6.25	6.20	6.92	6.43	6.51
Degalessa ..	4.65	4.67	5.25	4.68	5.48
Ederapolla ..	5.51	5.79	—	—	6.43
Kepitigalla ..	3.81	3.88	4.18	3.83	4.30
Lochnagar ..	3.34	3.40	3.51	3.44	3.43

In only two cases, Hewagam and Lochnagar, has there failed to be a response to manure. In the case of Ambatenne and Mirishena, Phosphate alone has effected a significant improvement though in both cases the full NPK mixture has done better still. On Epping Forest the PK mixture gives the best effect with no improvement from NPK while on Kepitigalla the NP gives the best effect with no significant improvement from NPK. On Ederapolla there is no NP or PK treatment and NPK is easiiy the best.

We have therefore that in six out of the eight estates NPK has done best, though in two of them it has not yet proved superior to PK and NP respectively. As an average we have therefore that NPK (5:6:5) is a satisfactory mixture for growth under all conditions that we have tested to date.

The lack of response on Lochnagar may be for two reasons, (a) a very adverse climate this year, (b) a very rich soil with both dolomite and mica outcroppings.

On Hewagam the lack of result is presumably due to the bad rat damage sustained by the experimental trees. This damage has been particularly severe on the fully manured trees suggesting that they have the more succulent bark. The conclusion of this experiment and the opening of another experiment in its place is under active consideration.

During the latter half of the year the Ederapolla area was top budded with LCB. 870 by the estate. This was by arrangement made when the area was originally agreed upon for the trial.

During the year it was also proposed that Kepitigalla and Lochnagar areas be top budded but it was pointed out that these represented a valuable trial of Polyclone Seed which would enable an accurate estimate of its value to be formed. I am pleased to be able to state that the companies concerned were kind enough to accept this viewpoint and the recommendations of the Visiting Agent, and that the area is to continue as originally laid down.

In furtherance of the question of the acidifying tendencies of Sulphur dusting we were fortunate to have access to an area of rubber, the leaves of which had been dusted at the rate of 250 lbs of sulphur per acre. Readings were taken of the soil pH within this area and no abnormal results were obtained. As the area formed a direct drainage basin into a set of paddy fields, readings were taken of the irrigation water pH, and values of 5.8 to 6.0 were recorded showing that there was no appreciable free sulphuric acid in the drainage from the area.

This result is to be expected on general grounds since even assuming complete recovery, as sulphuric acid in the soil, of the sulphur applied as dust to the leaves, the actual amounts would be of the order of 350 parts of acid per million of soil and this acid application is spread over a period of 1--2 months during which time 5--10 inches of rain fell on a very well drained soil.

With the co-operation of four commercial estates a trial has been carried out on Chlordane, an insecticide particularly effective against ants. The compound was found very effective against the large red tree nesting ant, Oeceophylla smaragdina, the nests of which could be completely destroyed by one or two sprays in reasonably dry weather. The trial is reported in greater detail in one of the Quarterlies now in printing.

A trial of chemical weed killers was planned, originally to investigate the eradication of Eupatorium oderatum, (Siam Weed). Such interest was taken by the various firms that it was found desirable to expand the scope of the trial and the following substances are represented: 2:4 dichlorphenoxyacetic acid (2: 4 D) 2:4:5 Trichlorphenoxyacetic acid (2:4:5 T) Methyl Chlorphenoxy acetic acid (MCPA) Penta chlorophenol (P.C.P) and aromatic oils. In addition Trichloracetic Acid (T.C.A), Chlorate Weedkiller, Borate Weedkiller, and Arsenic Weedkiller have also been provided through the courtesy of the various firms but are not included in the trial for economic reasons.

The firms taking part are Messrs I.C.I., Plant Protection, Shell and Monsanto Chemicals and the trial is to take place on Ederapolla Estate. The area to be used has been chosen as affording a good mixed stand of grasses, compositae, mimosa and ferns, i.e. a typical old rubber area on which cultivation was stopped during the slump of the thirties.

The trial should have started in mid August but unfortunately the S. W. Monsoon was nearly two months late in arrival and there was subsequently no appreciable break between the S. W. and N. E. monsoon's rain falling on about two out of every three days from August to October.

The trial has therefore been postponed until reasonably settled climatic conditions prevail, presumably in early 1954.

Deficiency symptoms which are occurring over an ever increasing area were closely studied during the year in the field as well as in the laboratory. On twelve estates we are taking experimental remedial measures, ten more have been visited and have had symptoms provisionally identified and another four estates have been reported to us as showing symptoms but have not yet been visited.

With the exception of the three cases mentioned under laboratory work the experiments have not been going sufficiently long for results to be visible. One aspect of this problem is that it is desirable to follow the appearance of a treated area for at least 15 months. There is some tendency to a seasonal appearance of these symptoms which are most marked in the last four months of the (calendar) year. Careful study of the appearance of normally wintering areas shows that the wintering process does not resemble the "yellowing" or vice versa, and, judging from the time factor, is not in any way connected. It is believed that the seasonal appearance of symptoms may be connected with infrequent applications of fertiliser, the discolouring appearing when all the soluble nutrients have been absorbed or leached away and persisting till wintering or the next application of fertiliser. Owing to the use of insoluble rock phosphate in fairly heavy quantities it is probable that the supply of phosphate is always satisfactory, thereby permitting continual growth of the tree and accentuating the potassium and nitrogen shortage. In this climate it is important to remember that the growth of a tree is virtually continuous and that no lengthy dormant period exists as in the temperate zone. Hence it is desirable to ensure that sufficient nutrients are available throughout the year and not just over a part of it.

Advisory Work.

Lectures were given to the General Committee of the P.A., the Sabaragamuwa P. A., The Kalutara P. A., the Kegalle P. A., and the Kandy P. A. on manuring and allied subjects and Advisory Circular No. 37 (to supersede all previous manuring circulars) was issued. In this latter emphasis was laid on conserving organic matter, utilising a mixture in which Potash had been increased to give NPK proportions similar to the tree's constitution (allowing for Phosphate fixation in the soil), and applying the mixture frequently in small doses to overcome excessive leaching on sandy soils with rainfalls, in general of 100-200 inches per year.

The visit to the Sabaragamuwa P. A. was preceded by a three day tour of the district during which a number of cases of deficiencies were noted and advised upon.

Fifty five visits were paid to estates during the year.

Correspondence

Inward	430
Outward	476

REPORT OF THE ESTATE DEPARTMENT FOR THE YEAR 1953

By

G. W. D. BARNET

SUMMARY

Buildings.

Extensions and improvements to the Factory and Drying Chamber, Chemical Department-Constant Temperature Room, Community Centres at Dartonfield and Hedigalla, 6 Double Cottages for labourers and a new Special Tunnel Type Smoke House were a part of the building programme for 1953. Buildings not completed in 1952 were finished this year. Existing buildings were properly maintained.

New Machinery.

One Guthrie Cadet Sheeting Mill, One C. C. C. Scrap Washer, Two Macerating Mills, One Special Spiral Fluted Washing Mill, Two smooth Mills and a Portable Gantry were installed in the Factory this year.

Electric Power and Water Supply

A 24 k. w. lighting set has been installed and a 160 k. w. lighting set is being installed by Messrs Harrisons Lister (Engineering) Ltd. Additional water-supply lines were provided where necessary on Dartonfield and Hedigalla.

Dartonfield Group.

The total cultivated acreage of the Group was 661 acres by the end of the year, of which 226¾ acres were tapped. The crop for the year amounted to 137664 lbs., representing a yield of 582.5 lbs. per acre on the tapped area.

The immature areas amounted to 415 acres in 1953, of which, 132 acres were planted in that year –14 acres in Dartonfield (replanted), 7 acres in Nivitigalakele (new planting) and 111 acres in Hedigalla (new planting). The total acreage of the budwood and seedling nurseries are 19¾ acres. All replanting and new planting were done according to experimental requirements and the Estate Superintendent was responsible for the practical side of this work and for the upkeep of other immature areas.

Most field and factory experiments were carried out with the assistance of Estate Department Staff.

Fomes lignosus root disease was the biggest problem in all the replanted areas. The control of Oidium heveae, Phytopthora leaf-fall and Corticium salmonicolor (pink disease) presented no great difficulties this year.

All mature and immature areas were manured in accordance with the Institute's. recommendations.

The Visiting Agent, Mr. J. D. Farquharson, inspected the Group twice during the year. The reports submitted by him on both occasions were very satisfactory.

The Rubber Controller's Nurseries at Egaloya were also in charge of the Estate Superintendent who was assisted by Mr. H. M. Buultjens, Officer-in-Charge, at Egaloya.

Visiting Agent.—The Visiting Agent, Mr. J. D. Farquharson, visited the Institute's properties on 12th/13th March and 26th August 1953. Reports on these two visits were submitted to the Rubber Research Board. Mr. Farquharson visited Dartonfield and Hedigalla at the request of the Experimental

Committee, too, on 17th October 1953 to report on the estimates for new motorable roads on these two Divisions.

Superintendent.—The writer was on duty throughout the year.

Staff.—Besides the writer, the Estate Department consisted of Estate Office (Mr. T. S. J. Peiris, Head Clerk, Mr. A. C. Swaris, Accounts Clerk, and Mr. E. T. Seneviratne, Assistant Clerk, and 1 peon) ; 3 Divisions of Dartonfield Group—Nivitigalakele (Mr. H. M. Buultjens, Conductor-in-Charge, and one K.P.), Dartonfield (Mr. L. P. de Mel, Conductor-in-Charge, and one K.P.) and Hedigalla (Mr. D. C. Kannangara, Conductor-in-Charge, and one K.P.) ; Rubber Factory (Mr. W. A. P. Wanasinghe, Rubber Maker, and Mr. O. de Alwis, Asst. Rubber Maker and Store Keeper) ; Field Experimental Staff (5 Experimental Conductors—Messrs J. Pitchamuttu at Nivitigalakele, D. R. Colonne and H. A. Mendis at Dartonfield and Messrs H. B. H. de Silva and K. D. Julius at Hedigalla who were assisted by 6 Field Attendants : 5 at Dartonfield and 1 at Nivitigalakele) ; one Estate Dispenser (Mr. L. M. Dias till 30-6-53 and Mr. B. R. E. Mendis, a Qualified Apothecary, from 1-7-53) ; one Senior Artisan (Mr. T. C. Fernando assisted by 3 Asst. Engine Drivers) ; and Electrician (Mr. K. C. L. Fernando) ; two school masters (one for Sinhalese at Hedigalla and one for Tamil at Dartonfield) ; and two motor-car and lorry drivers.

Mr. H. M. Buultjens, Conductor-in-Charge, Nivitigalakele, was transferred in May along with one Field Attendant to open up a 60 acre rubber nursery on the Government Farm at Egaloya for the Rubber Rehabilitation Subsidy Scheme. His place was taken at Nivitigalakele by Mr. J. Pitchamuttu in addition to his own duties. The vacancy caused by the transfer of the Nivitigalakele Field Attendant to Egaloya remained unfilled.

Mr. L. M. Dias (Estate Dispenser) retired from the Institute's service on 30-6-53 having reached the age limit. His place was filled by the appointment of Mr. B. R. E. Mendis a Qualified Apothecary, who was subsequenlty designated "Apothecary, R.R.I.C."

One Field Attendant (Mr. R. Ramalingam) left the services of the Institute on 31-5-33 and his place was filled on 1-6-53 by the promotion of a kangany.

Dartonfield Group.

Dartonfield Division

				A.	R.	P.
Field No.	1	1934	Replanted Area	7	2	16
do	2	1936	do	9	1	08
do	3	1938	do	19	0	37
do	4	1939	do	1	3	16
do	5	1941	do	5	3	18
do	6	1947	do	10	1	08
do	7	1950/51	do	26	2	30
do	8	1952	do	35	0	00
do	9	1952	Clonal Seedling	0	1	13
do	10	1953	Clone Museum & Myco. Dept. Area	14	0	00
			Old Seedling Rubber Areas	14	3	09
			Seedling Nurseries	1	3	26
			Cultivated Rubber Areas	146	3	21
			Buildings & Sites	24	2	34
			Roads	6	2	22
			Streams & Reservations	0	0	29
			Total ..	178	1	26

Nivitigalakele Division.

			A.	R.	P.
Field No.	1	1926 Clearing	13	0	00
do	2	1927 ,, ...	10	0	00
do	3	1928 ,, ...	15	3	28
do	4	1935 ,, ...	30	2	28
do	5	1939 ,, ...	10	1	01
do	6	1940 ,, ...	9	2	39
do	7	Deniya (1940)	3	0	24
do	8	1941 Clearing	7	0	26
do	9	1942 ,, ...	4	3	11
do	10	1943 ,, ...	7	0	00
do	11	1944 ,, ...	4	2	22
do	12	1946 Replanted Area	21	0	31
do	13	1953 Clearing	7	0	00
		Nurseries	15	3	25
		Cultivated Rubber Areas	160	1	35
		Buildings & Roads . ..	2	0	15
		Forest & Rocks	11	2	22
		Total ..	174	0	32

Hedigalla Division.

			A.	R.	P.
Field No.	1	1943 Clearing	10	0	32
do	2	1944 ,, ...	11	3	14
do	3	1945 ,, ...	22	1	19
do	4	1946 ,, ...	12	2	38
do	5	1947 ,, ...	45	0	15
do	6	1949 ,, ...	34	2	38
do	7	1950/51	20	0	00
do	8	1952 ,, ...	83	0	17
do	9	1953 ,, ...	111	0	02
		Nurseries	3	0	00
		Cultivated Rubber Areas	354	0	15
		Buildings & Roads..	7	3	34
		Forest & Streams	623	1	31
			985	2	00
		Grand Total ..	1338	0	18

Elevation : Factory at Dartonfield—215 feet.

Rainfall : Rainfall figures for 1949—1953 are shown below :—

	1949 ins.	1950 ins.	1951 ins.	1952 ins.	1953 ins.	5 Years Average 1949–1953 ins.
January ..	6.48	2.05	13.21	5.03	3.75	6.10
February ..	0.38	5.77	2.12	8.40	5.12	4.36
March ..	5.87	9.51	11.61	6.63	15.21	9.16
April ..	19.58	11.40	14.60	11.69	10.10	13.46
May ..	18.73	16.38	23.40	18.00	4.96	16.29
June ..	16.29	9.48	23.20	13.69	6.79	13.89
July ..	12.37	9.31	23.54	2.50	34.69	16.48
August ..	23.81	8.36	1.76	6.92	6.67	9.50
September ..	10.97	11.30	18.57	8.70	8.87	11.68
October ..	24.73	26.88	11.98	19.08	24.28	21.39
November ..	13.38	7.14	17.80	12.30	15.17	13.16
December ..	6.44	2.54	5.03	16.01	11.93	9.02
	159.03	120.12	166.82	128.95	147.54	144.49

There were 205 wet days in 1953 against 190 wet days in 1952. July was the wettest month of the year with 34.69 inches in 29 days.

Rubber Crop :

DARTONFIELD — YIELD RECORDS OF INDIVIDUAL FIELDS

	Acreage in Tapping	Total yield in lb. 1953	Total yield in lb. 1952	Yield per acre in lb. 1953	Yield per acre in lb. 1952
Old S'dling Rubber Area	—	—	11147	—	487.0
1934 R'pltd. Area (No. 1 Field)	7½	4,979	5,609	633.8	747.9
1936 „ „ (No. 2 „)	9½	5,890	6,013	620.0	632.9
1938 „ „ (No. 3 „)	19½	12,448	12,307	638.3	631.1
1939 „ „ (No. 4 „)	2	1,255	1,236	627.5	618.0
1941 „ „ (No. 5 „)	6⅕	4,385	3,921	674.6	603.2
1947 „ „ (No. 6 „)	10¼	3,403	2,110	332.0	191.8
Total acreage in tapping	55¼	32,360	42,343	585.7	519.5

NIVITIGALAKELE

1926 Clearing (No. 1 Field)	13	8,068	8,351	620.6	642.3
1927 „ (No. 2 „)	10	6,150	6,709	615.0	669.9
1928 „ (No. 3 „)	15¾	10,704	11,245	679.6	713.3
1935 „ (No. 4 „)	28⅕	22,218	23,324	779.5	818.4
1939 „ (No. 5 „)	10¼	9,899	8,971	965.7	875.1
1940 „ (No. 6 „)	9¾	6,872	7,416	704.8	760.6
1940 (Deniya) (No. 7 „)	3¼	2,250	1,901	692.3	585.0
1941 Clearing (No. 8 „)	7	7,238	7,091	1034.0	1013.0
1942 „ (No. 9 „)	5	3,868	3,922	773.6	782.4
1943 „ (No. 10 „)	3	987	343	328.3	114.3
1944 „ (No. 11 „)	4½	2,620	2,129	582.2	473.0
1946 R'pltd. Area (No. 12 „)	21	7,039	—	335.1	—
	131	87,913	81,402	671.1	740.0

HEDIGALLA

1943	Clearing	(No. 1 Field)	10¼	6.353	6,551	619.8	639.1
1944	,,	(No. 2 ,,)	11¾	5,588	5,511	475.5	469.1
1945	,, (Part)	(No. 3 ,,)	10½	2,736	610	260.5	58.1
1946	,, (,,)	(No. 4 ,,)	8	2,714	563	339.3	70.4
			40½	17,391	13,235	429.4	326.8
	Grand Total		226¾	137,664	136,980	607.1	582.9

	1953	1952
Estimated Crop ..	134,300 lb.	133,090 lb.
Harvested ,, ..	137,664 ,,	137,008 ,,
Excess ..	3,364 ,,	3,918 ,,

Tapping—Tapping was stopped on 1st February to rest the trees during refoliation and recommenced on 2nd March. During the resting period new tapping cuts were marked in the budded rubber areas where changes of panels were necessary. In the replanted and new planted areas additional trees were brought into tapping. The new field tapped this year was the 1946 replanted area at Nivitigalakele.

Analysis of Tapping Rounds for 1953 (1952 figures in brackets)

	Early tapping	Late tapping	Resting	Rain	No tapping H'days
1st Quarter ..	51 (62)	5 (5)	30 (24)	2 (2)	2 (2)
2nd Quarter ..	72 (37)	9 (28)	— (—)	8 (24)	2 (2)
3rd Quarter ..	52 (67)	23 (12)	— (—)	17 (12)	— (—)
4th Quarter ..	61 (67)	26 (13)	— (—)	2 (10)	3 (3)

Manufacture—The following kinds and grades of rubber were manufactured during the year:—

LATEX GRADES		TOTAL IN LB.	PERCENTAGE
Pale Crepe No. IX &	No. 1 ..	31,174	22.64
,, ,,	No. 2 ..	6,557	4.76
,, ,,	No. 3 ..	2,554	1.85
Creamed Ammoniated	Latex ..	62,005	45.04
Smoked Sheet	No. 1 ..	8,131	5.90
,, ,,	No. 2 ..	855	0.62
SCRAP GRADES			
Scrap Crepe	No. 1 ..	19,005	13.80
,, ,,	No. 2 ..	6,391	4.64
,, ,,	No. 3 ..	992	0.75
		137,664	100.00

*The percentage of Scrap Grades manufactured is necessarily high on account of the large amount of test tapping "biscuits" made in connection with experimental records of yields of individual trees.

Roads, Paths, Steps, etc.—All roads, paths, steps and bridges were maintained in good condition throughout the year.

Weeding—All the mature rubber areas in tapping were weeded every other month during the year and are clean and tidy.

Pests and Diseases

Bark Rot—Applications of oily and water-soluble fungicides were made to the tapped panels of the trees in dry and wet weather respectively as a preventive against this disease.

Oidium Heveae—The incidence of this disease was light. Sulphur dusting operations were carried out in accordance with the recommendations of the Mycology Department.

Fomes Lignosus—There were a few cases of this root disease in the mature rubber areas and these were treated in the recommended manner.

Fomes Noxius—A few cases occurred in Hedigalla and Nivitigalakele Divisions in the mature rubber areas and these were attended to.

Ustulina Zonata—This disease caused the deaths of a very few trees.

Phytopthora Palmivora—The incidence of this disease was mild and did not give cause for any anxiety.

Brown Bast—All known cases were treated. Those trees beyond redemption were uprooted and cut and stacked ' in situ '.

Canker Scraping—Canker scraping was done where necessary and 10% Brunolinum plantarium mixed with red powder was applied to the treated parts of the trees.

Corticium Salmonicolor (Pink Disease)—A few cases occurred and the affected parts of the trees were treated in the recommended manner.

Other diseases, etc.—Some trees were blown down by strong winds and these were cut and stacked '' in situ ''.

Details of all mature rubber trees lost during the year were given in the monthly reports of the Estate Department.

AGRICULTURAL DEVELOPMENT

1950/51 Replanted Area—26¾ Acres—Dartonfield

Weeding—These areas were weeded once a month during the year and are clean and tidy.

Pests and Diseases—Fomes lignosus root disease was the main cause of deaths of trees in this clearing. The infected trees and areas were treated in the recommended manner.

Manuring—R 4 : 6 : 5 manure mixture was applied at the rate of ½ lb. per plant per application in two applications.

1952 Replanted Areas—35 Acres—Dartonfield

Weeding—These areas were weeded once a month during the year and are clean and tidy.

Pests and Diseases—A fair number of cases of Fomes lignosus were found in these areas—mostly old known infected spots. These were attended to during the year in the usual manner.

Manuring—All the plants in these areas were manured twice during the year with R 4 · 6 : 5 manure mixture at the rate of ½ lb. per plant per application.

1953 Replanted Areas—14 Acres—Dartonfield (Clone Museum)

FELLING & CLEARING—An area of 5 acres of old seedling rubber trees was felled and cleared early this year.

LINING—Pegs were put out to mark the planting points.

CUTTING HOLES—Holes were cut $1\frac{1}{2}' \times 1\frac{1}{2}' \times 1\frac{1}{2}'$ with a 1' "alavango" hole in the centre of each hole.

FILLING HOLES—The holes were filled with top soil mixed with excavated earth free of stones.

GRASS & SHRUBS—All grasses and shrubs were weeded out.

COVER CROPS—All bare areas were planted with rooted cuttings of Desmodium ovalifolium.

WEEDING : This area was weeded every month during the year and is clean and tidy

PLANTING. CLONE MUSEUM—32 budded stumps of each of the following clones were planted in this clone museum: TJ.1, TJ.16, BR.2, BD.5, BD.10, BD.17, AV.49, AV.50, AV.152, AV.157, AV.163, AV.255, AV.256, AV.352, PB.23, PB.25, PB.86, PB.186, PB.6/5, PB.6/9, PB.5/60, PB.6/50, PB.5/122, PB.5/139, IR.7, IR.10, PR.105, PR.106, PR.107, HC.28, HC.55, WG.6278, MK.3/2, DBK.1, WAR.4, LUN-N, LCB.870, LCB.1320, CHM.3, KD.1, AD.24, RRIM.500, RRIM,501, RRIM.504. RRIM.513, RUB.303, SR.9, SAB.24.OE.1, TK.12, TK.26, Pil.A.84, Pil.B.48, Pil.D.65, NAB.12, NAB.15, NAB.17, NAB.20, GL.1, RLD.1, RLD.2, RLD.3, RLD.4, GRLD.5, RLD.6, and RLD.7.

BOTANICAL DEPARTMENT EXPERIMENT—Budded stumps of Hevea Brazziliensis, H. Spruciana and H. Benthimiana received from the R. R. I. of Malaya were planted in the area for the Botanical Department.

MYCOLOGICAL DEPARTMENT EXPERIMENT—An area of one acre was planted with budded stumps of various clones according to the requirements of the Mycology Dept.

MANURING—At the time of planting (i.e. N. E. Monsoon) each plant was given an initial dose of 8 ozs. of Animal Meal. These plants were manured again three months later with R 4: 6: 5 manure mixture at the rate of 4 ozs. per plant.

DRAINS & SILT PITS—Old drains and silt pits in the area were cleaned out or re-cut as required.

TERRACING—Old rock terraces were repaired and new ones were built where necessary.

SUPPLYING VACANCIES—All "casualties" were replaced with budded stumps of the appropriate clones.

BOUNDARIES—The barbed wire fences on the external boundaries of the area were repaired where necessary.

1943 Clearing (Part)—4 Acres—Nivitigalakele.

WEEDING—This area was weeded monthly during the year and is clean and tidy.

Pests & Diseases—A few plants succumbed to Fomes lignosus root disease and were dealt with in the recommended manner.

Manuring—This area was manured twice with R 4: 6: 5 manure mixture at the rate of 1 lb. per tree per application.

1953 Clearing—. 7 Acres —Nivitigalakele.

Felling, Burning & Clearing—Most of this work was completed in 1952 on suspense account. The arranging of the unburnt timber, roughly on the contour, was completed early this year.

Lining—This work was completed last year.

Boundaries—"Milla" fence posts and barbed wire were used for fencing this area.

Grass & Shrubs—All grass and shrubs in the area were removed.

Cover Crops—Rooted cutting of Desmodium ovalifolium were planted in all the previously cleared areas. Cuttings of Stylosanthes gracillis and seeds of Flemingia congesta were also planted in this area.

Weeding—This area was weeded every month during the year and is clean and tidy.

Cutting Holes—Planting holes were cut in accordance with the Institute's recommendations.

Filling Holes—All holes were filled with good top soil mixed with excavated earth.

Planting—Selected seedlings derived from mixed clones on Sorana Estate, Horana were planted in this clearing.

Manuring—All the plants were given an initial dose of 8 ozs. of Animal Meal each at the time of planting and two subsequent applications of R 4: 6: 5 manure mixture were made at the rate of 4 ozs. per plant per application.

Paths & Steps—Paths and Steps were constructed where necessary in this clearing.

Pests & Diseases—Except for a few cases of sun-scorch causing deaths of plants very little attention to the plants was required on this account.

Inspection & Attention—All extra shoots were cut off and only one allowed to grow as a continuation of the main stem of the stumped seedlings.

Supply Vacancies—All "vacancies" were "supplied" with suitable seedlings from the same source.

1945 Clearing (Part)—11¾ Acres—Hedigalla

Weeding—This area was weeded every month during the year and is clean and tidy.

Pests & Diseases—A few cases of Fomes noxius and Fomes lignosus were attended to. There were also some cases of wind damage.

Manuring—This area was manured twice with R 4 : 6 : 5 manure mixture at the rate of 1 lb. per tree per application.

1946 Clearing (Part)—4¾ Acres—Hedigalla

WEEDING—This area was weeded every month and is clean and tidy.

MANURING—The trees in this area were manured twice during the year with R 4 : 6 : 5 manure mixture at the rate of 1 lb. per tree per application.

PESTS & DISEASES—A few cases of Corticium salmonicolor occurred in this area and were dealt with in the recommended manner.

1947 Clearing—45 Acres—Hedigalla

WEEDING—This clearing was weeded regularly once a month and is clean and tidy.

MANURING—All the trees in this clearing were manured twice during the year with R 4 : 6 : 5 manure mixture at the rate of 1 lb. per tree per application.

PESTS & DISEASES—A few trees succumbed to Fomes lignosus root disease and the trees and their surroundings were treated in the recommended manner.

1949 Clearing—34¾ Acres—Hedigalla

WEEDING—This clearing was weeded regularly and is clean and tidy.

PESTS & DISEASES—Some cases of Fomes lignosus and Fomes noxius root diseases occurred during the year and these were dealt with.

MANURING—The plants in this clearing were manured twice during the year with R 4 : 6 : 5 manure mixture at the rate of 1 lb. per plant per application.

1950/51 Clearing—20 Acres—Hedigalla

WEEDING—This clearing was weeded once a month during the year and is clean and tidy.

MANURING—The plants in this clearing were manured twice during the year with R 4 : 6 : 5 manure mixture at the rate of 1 lb. per plant per application.

PESTS & DISEASES—Some cases of Fomes lignosus and Fomes noxius root diseases, resulting in the deaths of plants, occurred. These plants and their surroundings were treated in the recommended manner.

SUPPLYING VACANCIES—All "casualties" were replaced with budded stumps or stumped budgrafts of the appropriate clones.

1952 Clearing—83 Acres—Hedigalla

WEEDING—These clearings were weeded once a month throughout the year and are clean and tidy.

INSPECTION & ATTENTION—Stock "snags" were cut off in all the trees in these clearings.

PESTS & DISEASES—Some trees succumbed to Fomes lignosus root infection and the affected trees and their surroundings were attended to in the recommended manner.

MANURING—The trees in these clearings were manured three times during the year with R 4 : 6 : 5 manure mixture at the rate of 12 ozs.

per plant per application. The trees in the Agronomy Department Experimental Areas were manured in accordance with the requirements of that department.

1953 Clearing—111 Acres—Hedigalla

Felling, Burning & Clearing—This work was completed before the end of 1952 on suspense account.

Lining—Pegs, marking the places where planting holes would be cut, were put out.

Cutting Holes—Planting holes were cut $1\frac{1}{2}' \times 1\frac{1}{2}' \times 1\frac{1}{2}'$ with an "alavango" hole in the centre.

Filling Holes—All the holes were filled with sifted top soil and mixed with excavated earth.

Grass & Shrubs—All grass and shrubs in these areas were eradicated.

Cover Crops—Rooted cuttings of Desmodium ovalifolium and seeds of Pueraria phaseoloides were planted in areas which had been cleaned previously.

Weeding—The areas were weeded regularly once a month after the rubber plants had been planted.

Planting—In the Botanical Department Clone Trial Areas ($96\frac{1}{2}$) acres of the following clones were planted :—

RRIM.501, RRIM.513, LCB.870, LCB.1320, WG.6278, MK.3/2, LUN-N, TJ.1, RLD.1, RLD.2, RLD.3, RLD.4, RLD.5, RLD. 6, and RLD.7.

In the Seed Garden Area ($14\frac{1}{2}$ acres) the following clones were planted in accordance with a plan suggested by the Botanist :—

Seed Bearers :—TJ.1, TJ.16, PB.5/139, BS.3, WG.6278, MK.3/2, PR.107, and LCB.1320 and Male Parents BR.2, PB.23, AV.163, AV.157, AV.352, BD.10, LUN-N, GL.1, RRIM.513, RRIM.501, RRIM.504, HC.28, and AV.255.

Manuring—At the time of planting, all plants were given a dose of 8ozs. of Animal Meal manure each. Three months later they received 4 ozs. of R 4 : 6 : 5 manure mixture. After another three months they were manured with R 4 : 6 : 5 manure mixture at the rate of 4 ozs. per plant.

Paths & Steps—Paths and Steps were constructed where necessary in these clearings.

Pests & Diseases—All logs hampering holing operations were cut and shifted on this account.

Inspection & Attention—All stock "Snags" were cut off when the plants were ready for this operation.

Supplying Vacancies—All dead plants were replaced with budded stumps of the appropriate clone.

Boundaries—The external boundaries were fenced with Milla posts and barbed wire.

Upkeep of Coffee interplanted in 30 Acres of the 1949 clearing—Hedigalla

WEEDING—The cover crops were pulled back around each plant monthly on this account.

LEGUMINOUS SHADE TREES—Cuttings of Gliricidia maculata were planted to give additional shade to the coffee plants.

MANURING—Animal Meal manure was applied twice during the year at the rate of 8 ozs. per plant per application.

PRUNING—All plants were pruned at a height of 9" to encourage branching.

Ukpeep and establishment of Seedling Nurseries on Dartonfield Group (Revenue Account)

FELLING, BURNING & CLEARING—About 3 acres of jungle were cleared in Hedigalla for establishing a nursery there.

PREPARING BEDS—Beds were prepared after the land had been thoroughly grubbed out in the new areas. In the areas where seedlings were to be replanted the old beds were forked deep and re-made.

PLANTING—About 60,000 seedlings were planted in the nursery beds available in the Group.

WEEDING—All seedling nurseries were weeded monthly and were kept clean and tidy.

MANURING—All nurseries were manured regularly and in accordance with the recommendations of the Institute.

BUDDING & ATTENTION—Budded stumps were prepared for all the replanting and new planting requirements on the Group.

Upkeep and establishment of budwood nurseries on Dartonfield Group.

WEEDING—These nurseries were weeded once a month during the year and were kept clean and tidy.

MANURING—The plants in these nurseries were manured regularly in accordance with the recommendations of this Institute.

CLEANING DRAINS—All silted up drains were cleaned out and the soil was spread over the plant beds.

PLANTING—Budded stumps of clones required for future planting programmes were planted in prepared areas in Nivitigalakele.

PESTS & DISEASES—Some plants died as a result of Fomes lignosus root disease. The affected plants and their surroundings were cleaned and isolated in the recommended manner.

FENCING—Old fences were repaired where necessary and new ones were erected where required.

POLLARDING—Budwood of various clones were sold to Estates and Small Holdings on orders received through the Botanist and Smallholdings Propaganda Officer, respectively. The requirements of this Estate, too, were obtained from these nurseries.

LABELS—Labels were affixed to the newly planted budded stumps in these nurseries. New name boards were erected in the various blocks of clones in these nurseries.

FOOD PRODUCTION

In Dartonfield—About 2 acres of land were planted with sweet potatoes and manioc. The yams from these areas were sold to members of the R.R.I.C. staff and to the estate labourers.

In Nivitigalakele—About 1 acre of land was cultivated with sweet potatoes. The crops harvested from here were sold to the R.R.I.C. staff and estate labourers resident on Nivitigalakele.

In Hedigalla—About 10 acres of land were planted with sweet potatoes. The yams harvested from here were sold to the Institute's staff and the estate labourers.

FIELD AND FACTORY EXPERIMENTS

Assistance was given to the Agronomy Department in its manurial trials conducted on Dartonfield and on outside estates.

The Botanical Department was given assistance in Test Tapping done on this estate and on other estates. Sundry experiments in the use of rainguards and crown-budding were also done.

The Chemical Department required various samples of latices of various clones and these were given. Some experiments in the manufacture of rubber were done in liaison with this Department.

The Mycology Department were supplied with staff and labourers of the Estate Department for various experiments conducted by that Department especially in sulphur dusting and spraying operations.

All experimental planting programmes on this group were carried out by the Estate Department in accordance with the requirements of the Departments concerned.

1954 SUSPENSE ACCOUNT

1954 Replanting—4¾ Acres—Dartonfield

FELLING & CLEARING—About 2 acres of land were felled and cleared by the end of 1953.

PESTS & DISEASES—Areas, known to be infected with Fomes lignosus root disease, are being cleaned out.

1954 New Planting—10 Acres—Nivitigalakele

FELLING, BURNING & CLEARING—This work has been completed except for the reburning of a few logs.

1954 New Planting—184 Acres—Hedigalla

FELLING, BURNING & CLEARING—About 138 acres of jungle land have been felled, burnt and cleared.

LINING—This work is in progress. About 50 acres were completed by the end of the year.

CUTTING HOLES—About 25 acres have been completed so far. Rocky holes with insufficient depth of soil are being dynamited.

GRASS & SHRUBS—All grass and shrubs are being weeded out.

COVER CROPS—Rooted cuttings of Desmodium ovalifolium are being planted in areas from which grass and shrubs have been removed.

FILLING HOLES—About 24 acres were completed by the end of the year.

DRAINS—Drains are being cut in the "deniya" areas.

BUILDINGS ETC. (REVENUE ACCOUNT)

General Buildings—Repairs were effected and walls were repainted where necessary in the Offices and Laboratories.

Bungalows—All Senior Staff, Intermediate Staff and Assistant Staff bungalows were maintained in good order during the year.

Water and Power Supply—Water and Electric power supply lines were maintained in good order throughout the year.

Bungalow Furniture—Unserviceable rejected articles were replaced during the year. Repairs were effected to furniture where necessary.

Motor Vehicles—The Station Waggon, Jeep, Commer Lorry and Dodge Truck were properly maintained during the year.

Machinery—Mr. H. W. Hammond of the firm of Consulting Engineers, Messrs. H. W. Hammond & Co. inspected all machinery, electrical fittings and power lines in February this year and submitted his report to the Rubber Research Board.

Power House :

(*a*) 80/90 B.H.P. NATIONAL ENGINE worked satisfactorily during the year.

(*b*) 55 KW. 230 VOLTS D.C. GENERATOR driven by the above engine worked satisfactorily.

(*c*) 52 B.H.P. VERTICAL RUSTON ENGINE was sold this year with the R.R. Board's approval.

(*d*) 32 KW. 230 VOLTS D.C. GENERATOR direct-coupled to the above Ruston Engine was sold too with the Board's approval.

(*e*) 20 B.H.P. GARDNER OIL ENGINE (COLD START) was transferred to Hedigalla and is in good working order.

(*f*) 12 KW 230 VOLTS D.C. GENERATOR was also transferred to Hedigalla and is in good order.

(*g*) AIR COMPRESSOR driven by a 2 H.P. motor was sold together with the 52 B.H.P. Vertical Ruston Engine and the 32 KW Generator.

(*h*) 40 B.H.P. VERTICAL LISTER ENGINE was installed this year. The consulting Engineer has not inspected this engine as yet.

(*i*) 24 KW. 230 VOLTS D.C. GENERATOR by Higgs, direct coupled to the above Lister engine was also installed this year and has not been seen by the consulting Engineer.

(*j*) 240 B.H.P. VERTICAL BLACKSTONE ENGINE is being installed by Messrs Harrisons Lister (Engineering) Ltd.

(*k*) 160 KW.230 VOLTS D.C. GENERATOR by Brush, direct coupled to the above Blackstone engine is being installed by Messrs Harrisons Lister (Engineering) Ltd.

(*l*) 5 B.H.P. NATIONAL ENGINE at Nivitigalakele required some attention and minor repairs this year, too. This engine drives a $2\frac{1}{2}$ KW.230 D.C. Generator and a water pump.

Starting Air Bottles—The air bottle used for starting the 52 B.H.P. Vertical Ruston Engine was sold together with that engine. The other air bottle which serves the National Engine is in good order.

A new air bottle is being installed to serve the 240 B.H.P. Blackstone Engine.

Streamline Oil Filter—The Streamline Oil Filter, which is in the Dartonfield Power House, worked satisfactorily throughout the year.

Machinery in Factory

1—26″ Water-cooled Grooved Mill by Brown & Co., Ltd., driven by a 25 H.P. Electric Motor. The mill and motor are both in good order and worked satisfactorily throughout the year. This mill and motor are being shifted to a new site in the factory and will be used only for blanketing crepe rubber.

1—26″ Water-cooled Smooth Mill by Brown & Co., Ltd., driven by a 25 H. P. Electric Motor. The mill and motor are both in good order and worked satisfactorily during the year. This mill and motor have been shifted to a new site in the factory in keeping with the rest of the layout of mills suggested by Messers Brown & Co. Ltd.

1—26″ Water-cooled Grooved Mill (Hard Steel Rolls) by Brown & Co., Ltd. driven by a 12 H. P. Electric Motor. This mill and motor were both erected this year and have not been used so far.

1—26″ Water-cooled Grooved Mill (Soft Steel Rolls) by Brown & Co. Ltd., driven by a 12 H. P. Electric Motor. The mill and the motor were both erected this year and have not been used to date.

1—26′ Water-cooled Spiral/Fluted Washing Mill by Colombo Commercial Co. Ltd., driven by a 12 H. P. Electric Motor. The mill and motor were erected this year and have not been used so far.

1—26″ Water-cooled Smooth Mill by Brown & Co. Ltd., driven by a 12 H.P. Electric Motor. The mill and the motor were erected this year. They were used this year.

1—26″ Smooth Mill by Brown & Co Ltd. driven by a variable speed Electric Motor. The mill and motor were installed this year and have worked satisfactorily.

1—Scrap Washer by Colombo Commercial Co. Ltd., driven by a 12 H. P. Electric Motor. The Scrap Washer and Motor were installed by Messrs Brown & Co. Ltd., and are functioning satisfactorily.

1—Portable Gantry by Brown & Co. Ltd. This is proving to be very useful.

1—Sole Crepe Laminating Mill and 1½ H. P. Electric Motor. This mill and motor which were installed in the Sole Crepe Laminating Room, are parts of an old Smoke Sheet Battery of mills. They have not been used so far.

1—Guthrie Cadet Sheeting Mill supplied by Brown & Co. Ltd., together with a 5 H. P. Electric Motor. The mill and motor were installed this year and are working satisfactorily.

2—12″ Experimental Mills (one Grooved & one Smooth) driven by a 5 H. P. Electric Motor. These mills and the motor are in good order and functioned properly throughout the year.

Laminating Tables—'' Dexion '' laminating tables were constructed and put in the factory.

Machinery at Hedigalla Rubber House

1—24″ Spiral Sheeting Mill driven by a 1½ H.P. Electric Motor. The mill and motor are in good order. They were transferred from Dartonfield to their present site this year.

1—Small Smooth Sheeting Mill by Colombo Commercial Co., Ltd., hand driven is in good working order.

Machinery at Nivitigalakele Rubber House

2 Sheeting Mills (one smooth and one diamond grooved) which are operated by hand were in use throughout the year.

Machinery in Chemical Department Section of the Factory

1—6 N.H.P. Vertical Cross Tube Boiler is in good order and functioned satisfactorily.

1—30″ Hydro-Extractor driven by a 4 H.P. Electric motor. This machine and motor are in good order.

1—High Speed Disintegrator driven by a 3 H.P. Electric motor. The Disintegrator and motor are in good order.

1—Centrifugal Separator by De Laval driven by a ½ H.P. Electric motor is in good order.

1—Air Compressor by William Allday & Sons, is in good order.

1—Latex Evaporator is in good order.

1—Baling Press in good order.

1—Water Filter in good order.

1—Ball Mill driven by a 1 H.P. Electric motor is in good order.

1—Colloid Mill driven by a ½ H.P. Electric motor is in good order.

1—Vacuum Drier and Steam Pump is in good order.

1—Steam Vulcanising Press (Hand worked) is in good order.

2—Mixing Mills by David Bridge each fitted with 7½ H.P. Electric motors. The installation of one of these mills has not been completed.

1—Hydraulic Vulcanising Press is in good order.

1—Small Mixing Mill received but not installed.

Water Pump—There are now five electrically driven water pumps. They are in good order and functioned satisfactorily.

Circular Saw with Electric Motor—Supplied and installed by Colombo Commercial Co., Ltd.

Bungalow Lighting Installations were found to be in good order. Minor repairs to lights and power plugs were effected during the year where necessary.

Fuel Consumption of Power Plants: Details of fuel consumption in 1953 are given below :—

	Average per hour
80/90 B.H.P. National Engine	
Liquid Fuel ..	.. 2.11 gallons
Lubricating Oil ..	.. 0.20 ,,
20 B.H.P. Gardner Engine	
Liquid Fuel ..	.. 0.75 ,,
Lubricating Oil ..	.. .06 ,,
40 B.H.P. Lister Engine	
Auto Diesel ..	.. 1.33 ,,
Lubricating Oil ..	.. .08 ,,

Factory Extensions—The Factory was extended by three bays and a Dripping Loft was constructed, too. Fluorescent Lights were provided for the Sole Crepe Laminating Room and Tungsten Lamps over the rubber mills, etc. Six small fans were installed in the Dripping Loft to extract the humid air in this section of the factory. A covered gangway to the Drying Chamber was also constructed.

Special Tunnel Type Smoke House : This building was constructed by Messrs Brown & Co., Ltd., and will be used primarily by the Chemist for the experiments in the manufacture of Smoked Sheets and Air Dried Sheets.

Alterations to Drying Chamber/Smoke House : The dividing wall between the Drying Chamber and the Smoke House was removed and some alterations in the building were made to convert it into one Crepe Drying Chamber composed of two storeys.

Gas Plant : A new concrete building was constructed to house the Gas Plant.

Alterations to Intermediate Staff and Assistant Staff Chummeries : Certain essential alterations were done to the Intermediate Staff Chummery. The former Conductor's bungalow on Dartonfield was altered and extended to serve as an Assistant Staff Chummery.

Dispensary at Hedigalla : A suitable building to serve as a Dispensary at Hedigalla was constructed and furnished during the year.

Community Centres : At Dartonfield and Hedigalla were built and furnished during the year.

Servants' Quarters : Certain essential improvements in the Senior Staff Servants' Quarters were effected.

Mycology Department Store Room : A passage between the Botany Department office and Mycology Department office was converted into an additional Store Room for the Mycology Department.

Constant Temperature Room : A cooling and dehumidifying plant was installed for the Chemical Department in a room specially made for this purpose.

Labourers' Cottages : Six double cottages were built in Hedigalla according to Type Plan 91. Six double water-seal latrines were provided for these cottages.

Improvements to Assistant Staff bungalows : All the Assistant Staff bungalows on Dartonfield were provided with ceilings in their dining rooms, new kitchen sinks etc.

School and Schoolmaster's Quarters : This building which was started last year was completed early this year.

Converting Engine Driver's Quarters into workshop : Work on this account was completed early this year.

Store for Sulphur : This building was completed early this year.

Transferring Batteries to Old Workshop : This work, which was started last year was completed this year.

Water & Power Supply—Electric lights for Nivitigalakele Bangalow : Work on this account commenced last year and was completed this year.

Augmenting Factory Water Supply : The first stage of this scheme was completed this year. The second and final stage will be done in 1954.

LABOUR : Was settled and sufficient for the works in hand this year. More accommodation is being provided on Hedigalla for additional members of resident labourers to meet the demands of the planting programmes there. Wages were paid during the year in accordance with the Ordinance in force.

Dartonfield Group

CEYLONESE	RESIDENT	NON-RESIDENT	TOTAL
Men ..	115	136	251
Women ..	86	41	127
Children ..	11	2	13
NON-CEYLONESE			
Men ..	39	—	39
Women ..	37	—	37
Children ..	1	—	1
Total ..	289	179	468

ANNUAL HOLIDAYS : Annual holidays with pay were given to all labourers who were entitled to them according to the Ordinance.

MATERNITY BENEFITS : 10 ordinary and 13 alternative payments were made according to the Ordinance.

FEEDING CHILDREN : Free rations and $\frac{1}{4}$ lb. of bread were issued to each non-working child of labourers per diem.

HEALTH : The health of the members of the Institute's staff and the estate labourers has been satisfactory during the year.

INFECTIOUS AND CONTAGIOUS DISEASES : 6 cases of chicken-pox were detected on Dartonfield during the year—3 of them were isolated and treated on the estate and the other three were sent to the Infectious Diseases Ward at the Government Hospital, Neboda. 2 cases of measles were treated on the estate.

BIRTHS : 9 children were born during the year on Dartonfield Group,

DEATHS : There were three deaths on the Group this year.

HOOKWORM : Mass treatment of labourers on Dartonfield and Hedigalla Divisions was carried out by the staff of the M.O.H., Agalawatta. 162 labourers were treated on Dartonfield and 190 on Hedigalla. The Apothecary of this Institute treated 72 cases.

A list of the diseases treated by the Apothecary of this Institute are given below :

Influenza	492 cases
Malaria	4 ,,
Ulcers	180 ,,
Worms	132 ,,
Anchylostomiasis	72 ,,
Measles	2 ,,
Dysentery	— ,,
Other diseases	1,770 ,,
Total ..	2,652 cases

CORRESPONDENCE :

Inward	1,273
Outward	1,425

Rubber Controller's Nurseries at Egaloya: These nurseries were handed over to this Institute to be planted and looked after. Mr. H. M. Buultjens was appointed Officer-in-Charge of these nurseries on 10th May, 1953 and the writer assumed duties as Visiting Superintendent on the same date.

REPORT OF THE SMALL HOLDINGS DEPARTMENT FOR THE YEAR, 1953

By

W. I. PIERIS

SUMMARY

Advisory work in connection with permits issued to smallholders under the Replanting Subsidy Scheme was undertaken in addition to normal duties on new planting and mature rubber holdings.

All three Assistant Propaganda Officers went on their 3 months' end-of-contract leave at different periods during the year. The Probationary A.P.O. and 2 Rubber Instructors left the Department, and 2 Rubber Instructors and a Clerk-Translator were appointed and trained. 3 Rubber Instructors were given loans for purchasing motor cycles.

Replanting Scheme advisory work was confined to smallholdings of under 10 acres and small estates of 10—25 acres. 331 permits covering 661 acres were issued to the under 10 acre class and 221 permit-areas covering 462 acres were lined by Rubber Instructors. Planting was completed on 83 permit-areas (180 acres). 1821 advisory visits to replanting holdings were paid by the staff and a record sheet showing its full history is being maintained for each area. Instructors also supervised replanting work on 80, 32 and 37 acres respectively of the Government Rubber Allotments at Urumiwela, Thunbage and Arampola.

A leaflet (No. S.H.6) on "Replanting of Rubber Smallholdings under the Subsidy Scheme" was issued in English and Sinhalese.

4,709 middle and peasant-class new-planting permits, covering 7,717 acres, were issued by the Rubber Controller. 6,775 preliminary reports on the suitability of lands for Rubber were sent by the field staff. 25,254 additional advisory visits were paid to new-planting holdings. 348 permits (604 acres) were cancelled. There is much room for improvement in tapping on new-planted holdings, the chief defect being daily tapping. Wounding is evident on about 30% of the holdings. Ensuring proper tapping, by law if necessary, should be considered in future.

93,132 clonal seedlings, 29,084 budded stumps mainly of clone PB.86 and 5,905 yards of budwood were issued, mainly to new-planting smallholders. The production of planting material for new-planters in 1954 was discontinued as the nurseries were required for the Replanting Scheme.

9 Smallholders' Latex Centres supplied 80,103 gallons of latex to the Latex Corporation of Ceylon at Katukurunda. The price paid for latex was reduced from 2 cents below the top sheet price to 10 cents below the sheet price from September. 263 visits to the Centres were paid by the staff.

Instructors gave 824 sheet-making demonstrations to smallholders and sold 704 aluminium latex pans, 647 bottles of acid and 899 sq. ft. of mesh at concession rates. 55 demonstration and 65 private smokehouses were constructed for smallholders. 133 houses were improved. 7,085 visits were paid to smokehouses for improving sheet.

Rs. 13,293.96 was paid to 256 peasant-class new-planting permit-holders as soil conservation grants. 2,227 acres in 1,676 new-planting areas and 106 acres in 64 mature Rubber areas were lined by Instructors.

518 tapping, 88 budding, 167 disease control and 625 miscellaneous demonstrations were given by Instructors.

A paper on "The Work of the Smallholdings Department with Special Reference to the Rubber Rehabilitation Scheme" was read at the Rubber Conference on November 16th.

General

The Smallholdings Department is normally responsible for the care of mature rubber smallholdings in Ceylon as well as peasant and middle-class permit-areas issued under the New Rubber Planting Scheme. Advisory and other work in this respect was continued. Additional advisory duties in connection with small-holders who received permits under the Rubber Replanting Subsidy Scheme were undertaken during the year. The market price of smoked sheet remained constant at Rs. 1.35 per pound until 21st December, when it depreciated to Rs. 1.10 in terms of the renewed trade contract with China.

Staff

The Small Holdings Propaganda Officer, Mr. W. I. Pieris, was on duty throughout the year.

Mr. N. W. Palihawadana, Senior Assistant Propaganda Officer, went on 3 months' end-of-contract leave on 1st October and Mr. H. H. Peiris, Assistant Propaganda Officer (North) acted for him. Mr. H. H. Peiris, Assistant Propaganda Officer (North), and Mr. K. W. de Silva, Assistant Propaganda Officer (South), also went on their 3 months' long leave beginning 1st March and 1st June respectively. Mr. Peiris acted for Mr. K. W. de Silva and Mr. P. W. W. de Silva, Probationary Assistant Propaganda Officer, acted for Mr. Peiris during their absence. Mr. P. W. W. de Silva, Probationary A.P.O., was attached to the A.P.O.(S) for training until 31st January and acted as A.P.O.(N) until 30th November, when he left the service.

The following Rubber Instructors left the Department :

Mr. D. J. Ratnayake	Rubber Instructor, Kegalla	on 6th Mar.
,, B. D. de A. Gurusinghe	Rubber Instructor, Pasyala	on 30th Sept.

The following new appointments were made with effect from 1st May :

Mr. A. Ranatunge	Clerk-Translator.
,, L. L. Gunasekera	Rubber Instructor, Undugoda.
,, J. H. Suaris	Rubber Instructor, Warakapola.

All new officers were appointed on one year's probation and new Rubber Instructors were given a course of theoretical and practical training in rubber work before they were sent to their ranges :

The following Rubber Instructors were transferred :—

	From	To	On
Mr. M. D. Albert	Talpe	Pitigala	1st Feb.
,, W. G. V. de Silva	Pitigala	Talpe	1st Feb.
,, R. B. Heendeniya	Warakapola	Kegalle	15th June
,, M. D. M. Gunawardena	Undugoda	Colombo Off.	16th June
,, M. D. M. Gunawardena	Colombo Off.	Talangama	29th Aug.
,, R. B. Madawala	Hiniduma	Dept. of Agr.	1st Aug.
,, A. Suriyaaracci	Talangama	Hiniduma	1st Sept.

Loans for the purchase of motor-cycles were given to :—

Mr. K. A. M. Perera	R.I., Kamburupitiya	.. Rs.	1,200.00
,, R. Gunadasa	R.I., Talgaswela	.. ,,	2,487.50
,, S. C. Rajasinghe	R.I., Nivitigala	.. ,,	2,450.00

Replanting

The request of the Rubber Replanting Advisory Board that the Smallholdings Department should undertake the advisory work on smallholdings which received permits under the Replanting Subsidy Scheme was acceded to by the Rubber Research Board. It was decided to confine the scope of such work to all replanting holdings of under 10 acres and to small estates of 10—25 acres, with the difference that Rubber Instructors will visit and advise every holding of the former class and also do lining free of charge, while they will visit the latter only on request and give a demonstration in lining without lining the entire area.

The number of permits issued by the Rubber Controller to the under 10 acre class in 1953 was 331 covering 661 acres. 226 permit-areas covering 462 acres were lined by Instructors, who begin visiting them as soon as the permit copy is received from the Rubber Controller. Planting was completed on 83 of these covering 180 acres. 1,821 advisory visits to replanting holdings were paid by the field staff.

In view of the vast importance of the Replanting Scheme to the country, special attention was given to this work and many of the small holdings replanted so far compare favourably with estate standards. A specially prepared record-sheet is being kept for every holding, which will show its progress from the inception and at each visit of the Instructor. Although permits covering 661 acres only were issued to smallholders in 1953 due to lack of ready supplies of suitable planting material, a total of 4000 acres will be issued in 1954 which, with other duties, will keep the staff pretty busy. It is likely that the appointment of additional Rubber Instructors will be necessary in 1954. The position regarding planting material for 1954 has been fully catered for through large nurseries opened by the Rubber Research Institute and Department of Agriculture this year.

Instructors also visited and supervised replanting work on the Government Rubber Allotments at Urumiwela, Thunbage and Arampola where 80, 32 and 37 acres respectively are being replanted under the Subsidy Scheme.

The attention of the Rubber Controller was drawn to the desirability of enforcing penalties for bad tapping on Replanting Scheme smallholdings.

Replanting Leaflet

A leaflet (No. S. H. 6) entitled ''Replanting of Rubber Smallholdings under the Subsidy Scheme'' was written and issued both in English and Sinhalese. It explains very concisely and in simple language the full sequence of field operations for obtaining the replanting subsidy and the stages at which the five instalments for the subsidy will be paid. A slightly modified version of the same leaflet was translated for the Rubber Controller.

New Planting

Visiting, lining and giving general advice on new-planting holdings continued to occupy a considerable portion of Rubber Instructors' time. Apart from the new permits issued each year, contact has to be maintained with permit-areas planted since the inception of the N. R. P. S. in 1939 which means an annually-increasing turn-over of work in this respect.

The Rubber Controller issued 4709 middle-class and peasant-class new-planting permits during the year, comprising 7717 acres. Each of these holdings has to be inspected by a Rubber Instructor and a preliminary report on its suitability sent to the Rubber Controller before a permit is issued. 6775 preliminary reports, which entailed 8447 visits, were sent. After the issue of a permit a second visit has to be paid to every peasant-class area and to those middle-class areas whose owners request advice, during the course of which an Instructor gives general advice and arranges to line for holes and drains. Subsequent advisory visits are paid as necessary to ensure a satisfactory plantation. Each visit and the work done are recorded in a record sheet bearing the permit number and other particulars of the holding. A total of 25,254 visits to new-planting and new-planted holdings was made during the year, excluding the 8449 visits for preliminary reports. 348 permits covering 604 acres were cancelled for neglect.

Although smallholders are tapping their new-planted holdings with greater care than their old seedling plantations, there is far too much daily tapping going on. No accurate statistics are available, but the experience of field officers is that about 21% of the holdings in tapping are well tapped (*i.e.* alternate daily and without wounding), 52% are tapped daily but without wounds and the balance 27% are badly tapped (*i.e.* daily tapped and wounded). It is, therefore, necessary that in future planting schemes like the Replanting Subsidy Scheme, the tapping of subsidised plantations should be controlled, if necessary by law.

6,664 plants in 51 peasant-class holdings were budded by budders employed by this Department at a cost of Rs. 533.12.

Planting Material

In accordance with the usual practice fairly large supplies of planting material were issued to new-planting smallholders during the year, but instructions were received from the Minister for Agriculture & Food that no material need be provided for issue in 1954 and that N.R.P.S. clonal seedling and budwood nurseries in Government Farms should be handed over to the Rubber Controller for requirements of the Replanting Scheme. No new material for 1954 was, therefore, planted but available supplies were issued as follows :

(*a*) 93,132 clonal seedlings were issued either free to peasant-class new planters or on payment to others from nurseries at Walpita, Eraminigolla, Labuduwa, Horana, Karapincha and Egaloya.

(*b*) 24,140 budded stumps of PB.86 and 4944 of LCB.870 were sold from the nurseries at Nivitigalakele and Karapincha. 45,340 plants at the Nivitigalakele nursery were budded, of which 34,189 or 75% were successful.

(*c*) 2,316 yards of budwood of clones PB.86, LCB.870 and PR.107 were issued free to peasant-class new-planters, 1,189 yards sold to others and 2,400 yards used for budding the Nivitigalakele smallholders' nursery.

The budwood nurseries in the Government Farms at Egaloya and Eraminigolla were pollarded for providing fresh budwood for the Replanting Scheme in 1954. 723 visits to departmental and smallholders' nurseries were paid by the field staff.

Latex Centres

9 Smallholders' Latex Centres continued to supply latex to the Latex Corporation of Ceylon at Katukurunda during the year. A total of 80,103 gallons of latex was supplied. Owing to losses sustained by the Corporation through the China Rubber Agreement, the price paid per pound, however, was reduced in September to 10 cents below the top market price of Sheet as against the previous price of 2 cents below the top sheet price. Smallholders who were supplying latex to the centres accepted this rate with some reluctance, but they had no option as many of them had dismantled their smokehouses and disposed of their sheet-making equipment. An extension of the contract to supply latex at the same rate for the first 6 months of 1954 was effected, but there is dissatisfaction regarding the rate of payment especially in view of the reduction of the sheet price from Rs. 1/35 to Rs. 1/10.

263 visits to Latex Centres were made by Rubber Instructors.

Sheet Improvement

The improvement of the quality of smallholders' sheet became even more necessary towards the end of the year with the reduction of the market price of Grade 1 sheet to Rs. 1/10 and the consequent wide disparity in price paid to the lower grades by the Rubber Commissioner. Instructors gave sheet-making demonstrations, popularised the building of suitable cheap smokehouses, supplied good acid, mesh and latex pans at concession rates, in their endeavours to improve the qualtiy of sheet. 824 sheet making demonstrations were given and 704 aluminium latex pans, 647 bottles of acid and 899 sq. ft. of mesh were sold. 587 samples of acid were tested. 79 demonstration and 72 private smokehouses were started and 55 demonstration and 65 private ones completed. 133 existing houses were improved Instructors paid 7085 visits to smallholders' smokehouses and 847 visits to Rubber Commissioner's Depots regarding the marketing of sheet. 2 Rollers were bought for the Kahagalla Co-operative Sheet Society through the Department.

Soil Conservation

Free lining for soil conservation was done by Instructors on mature rubber, Replanting and New-Planting holdings. Rs. 13,293/96 was paid to 256 peasant-class new-planting permit-holders as soil conservation grants. Instructors lined 2,227 acres in 1676 new-planting areas and 106 acres in 64 mature rubber areas. The extent of replanting areas lined is mentioned under "Replanting".

Demonstrations

Practical demonstrations to smallholders on subjects of interest were given by Instructors as often as other duties permitted. Sheet-making demonstrations have been referred to earlier. In addition 518 tapping, 88 budding, 167 disease control and 625 miscellaneous demonstrations were given.

Correspondence

General :	Inward	3,216
	Outward	8,006
With Rubber Controller :	Inward	2,910
	Outward	7,457

General

A paper on "The Work of the Smallholdings Department with Special Reference to the Rubber Rehabilitation Scheme" was read at the Rubber Conference in Colombo on November 16th.

Inspection reports on various Rubber colonies, nurseries etc. were sent to Government Agents and other Government Departments from time to time.

AUDITOR GENERAL'S REPORT FOR 1952

No. M—2/RRI,
Audit Office,
Colombo 7: 26th November, 1953.

The Chairman,
Board of Management,
Rubber Research Institute,
Agalawatta.

Sir,

The accounts of the Rubber Research Institute, Agalawatta (Ceylon) for the year ended 31st December 1952, were audited under my direction. The financial statements *viz :*

(*a*) Capital Account, Revenue Account and General Balance Sheet,
(*b*) Dartonfield Group Working Account,
and (*c*) Provident Fund Working Account,

were compared with the books and accounts and found to agree. The Balance Sheet has been duly certified and is returned herewith. The following are the comments which I consider it necessary to offer on these accounts.

I. INCOME

2. The actual income for the year amounting to Rs. 1,582,225.03 fell short of the estimated income of Rs. 1,610,129.00 by Rs. 27,903.97 and was less than the actual income for the previous year by Rs. 124,887.10. A comparative statement showing the estimated and actual income under the different accounts is annexed marked 'A'. The reasons for the variations are indicated in that statement.

3. **Dartonfield Group** : The working account of the Dartonfield Group shows a profit of Rs. 78,166.34 which is much less than the profit of Rs. 210,299.92 for the previous year. The reduction in profit is due partly to a reduction in output of about 20% when compared with the previous year, and partly to a fall in prices of about 33%. While the total production of both crepe rubber and creamed latex fell from 167,049 lbs. in 1951 to 137,024 lbs. in 1952, the average sales prices fell more steeply from Rs. 1·95 to Rs. 1·32 per lb. for crepe rubber and from 2·06 to 1·60 per lb. for creamed latex. Certain cases of overpayment of wages have been brought to the notice of the Superintendent.

4. The interest on investments for the year amounted to Rs. 83,616.75 as compared with Rs. 67,099.13 for the previous year, showing an increase of Rs. 16,517.62 due mainly to the investment of a sum of Rs. 600,000.00 in Government Loan Stocks in July, 1952. This sum, however, fell short of the estimate by Rs. 10,383.25 due to maturity of an investment and withdrawal of a fixed deposit.

II. EXPENDITURE

5. **Revenue Expenditure** : The total expenditure on revenue account exclusive of amount provided for depreciation of fixed assets (Rs. 44,024.29) and audit fees (Rs. 1,600.00) amounted to Rs. 920,244.38 as compared with Rs. 762,936.91 for the previous year. The details of the revenue are set forth in the Revenue Account which was examined in audit with the connected vouchers and accounts in support thereof.

6. **Capital Expenditure** : The net addition to Capital amounted to Rs. 589,617.69 as compared with Rs. 246,198.77 for the previous year.

7. **Estimated and Actual Expenditure** : A statement showing the approved estimates of expenditure as compared with the actual expenditure is attached. The reasons for the variations as furnished by the Director, are given against each item. Under Revenue Expenditure there has been excess expenditure on 20 items aggregating Rs. 73,583.78 and under Capital expenditure there was a total excess of Rs. 17,546.54 on 18 items.

Covering sanction of the Board will have to be obtained for the excess expenditure under these items.

8. **Provident Fund Reserve—Rs. 365,570.35** : The balance to the credit of the fund on 31.12.1951 was Rs. 259,656.61. Additions to the fund during 1952 amounted to Rs. 110,910.36 and payment to 8 retiring officers amounted to Rs. 4,996. 62 leaving a sum of Rs. 365, 570. 35 to the credit of the fund at the end of the year.

9. **Advance Account—Rs. 45,111.17** : This includes a sum of Rs. 26,869.19 being the balance as at 31.12.1952 with the Superintendent, Dartonfield Group and a sum of Rs. 13,851.55 due from the London Advisory Committee representing balance of advances made to it to meet cost of supplies and services obtained by the Committee for the R. R. I.

10. **Payments in Advance—Rs. 13,237.04** : This is made up as follows :—

DARTONFIELD ADVANCE WORK

Replanting ..	.. Rs.	1,576.28	
Clearing Hedigalla ..	.. „	10,587.53	
Replanting Nivitigalakele	.. „	438.24	
Seedling Nurseries ..	.. „	192.99	
			Rs. 12,795.04
P.M.G. Rental ..	..	.. „	240.00
London Advisory Committee (for Journals)		.. „	202.00
			Rs. 13,237.04

11. **Stocks—Rs. 51,428.01** : Comprises the following :—

Materials ..	..	.. Rs. 50,045.77
Rice and Foodstuffs	..	.. „ 1,382.24
		Rs. 51,428.01

and represents stock in hand on 31-12-1952. These have been valued at cost price.

12. **Board of Survey Report for 1952** : The Report of the Annual Board of Survey for 1952 has not been furnished in audit with the result that it has not been possible to verify the physical existence of some of the items of fixed assets, and of furniture and equipment, machinery, plant, tools and apparatus appearing in the Capital Account, and of stocks valued at Rs. 51,428.01 appearing in the General Balance Sheet as at December 31, 1952.

13. **Outcome of the Accounts** : There was a surplus of Rs. 1,657,074.98 at the beginning of the year and the excess of income over expenditure for the year 1952 amounted to Rs. 616,356.36 which increased the surplus to Rs. 2,273,431.34. After appropriating a sum of Rs. 589,617.69 for capital expenditure a balance of Rs. 1,683,813.65 was carried forward to the year 1953. Reserves provided for stabilization of income amounted to (Rs. 1,000,000.00) and for depreciation of fixed assets to (Rs. 364,426.99) as at December 31, 1952.

III. GENERAL

14. The accounts were received quarterly and audited in this office. The office of the Institute at Dartonfield Estate, Agalawatta was visited by my officers in September, October and November, 1953, in connection with the inspection of books and records and verification of cash and investments etc.

I am Sir,
Your Obedient Servant,
Sgd. D. S. DE SILVA,
for Auditor-General

RUBBER RESEARCH INSTITUTE OF CEYLON

REVENUE ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1952

Dr.

			Rs.	Cts.
To Personal Emoluments :				
Senior Scientific Staff	Rs.	127,802.74		
Junior Scientific Staff	,,	30,523.35		
Office Staff	,,	34,847.90		
			193,173	99
,, Library & Publications :				
Library	Rs.	4,039.07		
Publications	,,	7,861.40		
			11,900	47
,, Smallholdings Work :				
Salaries & Allowances	Rs.	189,771.55		
Travelling & General Expenses	,,	65,856.45		
			255,628	00
,, Laboratory :				
Equipment & Working Expenses	Rs.	23,498.20		
Furniture Replacements	,,	602.27		
			24.100	47
,, Field & Factory Experiments :				
Field Experiments	Rs.	18,547.19		
Factory Experiments	,,	410.93		
			18,958	12
,, Office :				
Stationery & Office Equipment	Rs.	4,161.20		
Postage & Telegrams	,,	2,813.59		
Advertising	,,	1,074.09		
Telephone	,,	1,845.31		
Audit	,,	1,600.00		
			11.494	19
,, Travelling :				
Expenses of Board Members	Rs.	2,018.67		
Expenses of Staff	,,	26,917.73		
			28,936	40
		Carried Over	544,191	64

Cr.

	Rs.	Cts.
By Cess Collections	1,153,685	10
,, Government Grant for Smallholdings work	264.060	00
,, Profit from Dartonfield Group	78,166	34
,, Interest	83,616	75
,, Sale of Publications	1,457	67
,, Sundry Receipts	1,239	17
Carried Over	1,582,225	03

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1952 (Contd.)

Dr.

		Rs.	Cts.
	Brought Forward	544,191	64
,, Maintenance of Buildings, Power & Water Supply & Motor Vehicles :			
General Buildings .. .. Rs.	2,101.81		
Bungalows .. .. ,,	5,726.42		
Power & Water Supply .. ,,	6,869.86		
Bungalow Furniture Replacements ,,	1,933.87		
Motor Vehicles .. .. ,,	6,510.43		
		23,142	39
,, Miscellaneous Items Shared with Estates :			
Dartonfield Group General Charges Rs.	101,713.04		
Upkeep of Roads & Grounds .. ,,	2,760.99		
Upkeep of Bungalow Premises .. ,,	7,151.45		
Factory Upkeep .. .. ,,	9,491.66		
Power Supply .. .. ,,	14,251.91		
		135,369	05
,, Other Charges :			
Contribution to London Advisory Committee .. .. Rs.	30,666.67		
Contingencies .. .. ,,	1,222.28		
Insurance .. .. ,,	6,276.63		
Staff Provident Fund .. ,,	64,428.07		
Passages .. .. ,,	15,000.00		
Entertainment Allowance .. ,,	132.00		
Dearness Allowance to Staff .. ,,	88,939.50		
Contribution to Medical Fund .. ,,	6,061.89		
Social Services .. .. ,,	1,199.04		
Colombo Plan Exhibition .. ,,	2,642.50		
Senior Staff Medical Scheme .. ,,	2,572.72		
Depreciation .. .. ,,	44,024.29		
		263,165	59
,, Balance, being excess of Income over Expenditure for the year carried forward to Balance Sheet ..		616,356	36
	Rs.	1,582,225	03

Cr.

	Rs.	Cts.
Brought Forward	1,582,225	03
Rs.	1,582,225	03

RUBBER RESEARCH INSTITUTE OF CEYLON

CAPITAL ACCOUNT AS AT 31ST DECEMBER, 1952

EXPENDITURE	To December 31st, 1951 Rs.	Transfers Between A/cs. Rs.	Additions in 1952 Rs.	Total Rs.
To Land including Development :				
Dartonfield	176,443.01		45,188.65	221,631.66
Nivitigalakele	166,013.01		8,143.90	174,156.91
Hedigalla	214,541.84		88,965.06	303,506.90
,, Buildings & Lines :				
Dartonfield—				
Estate	103,414.37		107,316.60	210,730.97
Headquaters	344,633.38		93,154.91	437,788.29
Nivitigalakele—				
Estate	42,316.47		3,628.74	45,945.21
Headquarters	21,993.03			21,993.03
Hedigalla—				
Estate	56,110.28		91,988.25	148,098.53
Headquarters	18,628.62			18,628.62
,, Furniture & Fixed Equipment :				
Dartonfield	89,203.77		20,740.25	109,944.02
Nivitigalakele	5,733.70			5,733.70
Hedigalla	1,764.25			1,764.25
,, Power & Water Supply :				
Dartonfield	108,564.65		19,155.61	127,720.26
Nivitigalakele	5,128.09		2,735.61	7,863.70
Hedigalla	2,506.79		3,543.45	6,050.24
,, Machinery & Tools :				
Dartonfield	188,662.92		81,157.92	269,820.84
Nivitigalakele	4,754.23			4,754.23
Hedigalla	——		2,711.06	2,711.06
,, Laporatory Apparatus	71,018.32		21,187.68	92,206.00
,, London Plant	11,333.34			11,333.34
	1,632,764.07		589,617.69	2,222,381.76

RECEIPTS	Rs.
By Revenue applied for Capital purposes :	
At 31st December, 1951 ..	1,632,764.07
In 1952 ..	589,617.69
	2,222,381.76

RUBBER RESEARCH INSTITUTE OF CEYLON

GENERAL BALANCE SHEET AS AT 31ST DECEMBER, 1952

LIABILITIES			Rs.	Cts.
CREDITORS :				
Sundries ..	.. Rs.	48,829.02		
Receipts in Advance ..	..	149,632.00		
			198,461	02
PASSAGE FUND RESERVE :				
At December 31, 1951	.. Rs.	31,154.65		
Add Reserve for 1952	..	15,000.00		
	Rs.	46,154.65		
Less Payments in 1952	..	21,500.37		
			24,654	28
DEPRECIATION RESERVE :				
At December 31, 1951	.. Rs.	320,402.70		
Add Reserve for 1952	..	44,024.29		
			364,426	99
PROVIDENT FUND RESERVE :				
At December 31, 1951	.. Rs.	259,656.61		
Additions during 1952	.	110,910.36		
	Rs.	370,566.97		
Less Payments in 1952	..	4,996.62		
			365,570	35
MEDICAL FUND :				
At December, 31, 1951	.. Rs.	14,855.74		
Additions during 1952	..	12,407.27		
	Rs.	27,263.01		
Less Payments in 1952	..	5,847.23		
			21,415	78
AUDIT FEE RESERVE :				
At December, 31, 1951	.. Rs.	1,763.63		
Add Reserve for 1952	..	1,600.00		
	Rs.	3,363.63		
Less Payments ..	.	1,215.20		
			2,148	43
		Carried Over	976,676	85

ASSETS				Rs.	Cts.
DEBTORS :					
Cess Collection for December 1952 ..	Rs.	126,807.55			
Sundries		60,878.46			
				187,686	01
ADVANCE ACCOUNTS :					
Estate Superintendent—					
Dartonfield Group ..	Rs.	26,869.19			
Smallholdings Propaganda Officer—					
General Account ..	,,	1,936.11			
Soil Conservation A/c	,,	2,294.32			
London Advisory Committee ..	,,	13,851.55			
Postmaster General ..	,,	160.00			
				45,111	17
Deposit with Proefstation der C.P.V.			..	116	62
ACCRUED INTEREST ON INVESTMENTS : ..			..	6,222	21
PAYMENTS IN ADVANCE : ..			..	13,237	04
STOCK :					
Estate			..	51,428	61
LOANS TO OFFICERS . ..			..	22,627	45

INVESTMENTS :		Face Value	Middle Market Value at 31-12-51	
In Cey. Govt. 3½% Loan 1957/62 ..	Rs.	25,000.00	26,609	37
do 3% Loan 1956/60 ..	,,	20,000.00	20,812	50
Carried Over		45,000.00	373,850	38

GENERAL BALANCE SHEET AS AT 31st DECEMBER 1952 (Contd.)

LIABILITIES			Rs.	Cts.
		Brought Forward	976,676	85
RESERVE FOR STABILISATION OF INCOME :				
At December 31, 1951 ..	Rs.	1,000,000.00		
Additions in 1952	,,	—		
			1,000,000	00
APPRECIATION OF INVESTMENTS ..		..	26,646	87
SURPLUS ACCOUNT :				
At December 31, 1951 ..	Rs.	1,657,074.98		
Add Excess of Income over Expenditure for 1952 ..	,,	616,356.36		
	Rs.	2,273,431.34		
Less Contribution to Capital outlay	,,	589,617.69		
			1,683,813	65
		Rs.	3,687,137	37

ASSETS			Rs.	Cts.
		Brought Forward	45,000.00	373,850 38
INVESTMENTS (Contd.)				
do	3¼% Home Defence Loan 1953 ..	,,	30,000.00	30,375 00
do	3½% National Loan 1964/69 ..	,,	70,000.00	75,600 00
do	3¼% National Loan 1956 ..	,,	100,000.00	105,875 00
do	3% National Loan 1954	,,	5,000.00	5,187 50
do	3% Defence Loan 1954	,,	15,000.00	15,000 00
do	3% Sri Lanka Loan 1969/74 ..	,,	750,000.00	758,437 50
do	3% Govt. Loan 1966/71	,,	500,000.00	502,500 00
do	3% Govt. Loan 1972/77	,,	500,000.00	501,250 00
do	3% Loan 1973/79 ..	,,	600,000.00	600,000 00
Ceylon State Mortgage Bank 3¼% Debentures		,,	398,150.00	398,150 00
		Rs.	3,013,150.00	
CASH BALANCES :				
At Ceylon Savings Bank ..			..	4,138 03
On Savings Deposit (Bank of Ceylon)			..	9,164 48
In Current Account No. 1 ..			..	307,234 40
In hand			..	375 08
			Rs.	3,687,137 37

The accounts of the Rubber Research Institute for the year ended December 31, 1952 have been audited under my direction. Subject to the observations in the accompanying report as a result of this audit I am of opinion that the Balance Sheet and Financial Statements above set forth have been drawn up in accordance with the Books and Records maintained by the Institute so as to present fairly the financial position of the Institute as at December 31, 1952 and the results of its operations for the year ended on that date.

Sgd. D. S. DE SILVA
for Auditor Genera

Audit Office
Colombo 7 : 26th November 1953.

DARTONFIELD GROUP

WORKING ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1952

Dr.

			Rs.	Cts.
To Expenditure :				
General Charges	.. Rs.	33,287.91		
Upkeep, Manufacture and Distribution	,,	65,178.70		
			98,446	61
,, Upkeep of Nurseries ..		..	18,830	25
,, Handling and Distribution of budwood and budded stumps ..		..	1,915	40
,, Balance being excess of Income over Expenditure transferred to Revenue Account		..	78,166	34
	Rs.		197,378	60

Cr.

			Rs.	Cts.
By Sale of Produce :				
Manufactured Rubber (112 558 lbs.)	Rs.	148 886.34		
Creamed Latex (24 466 lbs.)		39 250.65		
			188,136	99
,, Sale of Food Crops ..	Rs.	951.56		
Less Expenditure ..	,,	369.30		
			582	26
,, Sale of Planting Material etc. ..		..	8,659	35
	Rs.		197,378	60

PROVIDENT FUND

WORKING ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1952

Dr. **Cr.**

	Rs.	Cts.		Rs.	Cts.
To Payment to 8 retiring officers	4,996	62	By Balance brought forward from 1951 ..	259,656	61
,, Balance carried forward to 1953	365,570	35	,, Board's Bonus for 1952	51,958	96
			,, Interest on Officers' Contributions ..	5,519	66
			,, Interest on Board's Bonus Account ..	6,887	87
			,, Bonus paid to 2 retiring officers	40	50
			,, Interest for 1952 paid to 4 retiring officers ..	21	08
			,, Members' Contributions during 1952 ..	46,482	20
Rs.	370,566	97	Rs.	370,566	97

"A"

ESTIMATES AND ACTUAL INCOME STATEMENT FOR 1952

	Estimate Rs.	Actual Income Rs.	Excess Rs.	Deficit Rs.	
Cess Collections	1,232,000.00	1,153,685.10	——	78,314.90	Over estimate
Interest	94,000.00	83,616.75	——	10,383.25	Maturity of an investment and withdrawal of a fixed deposit.
Sale of Publications	1,000.00	1,457.67	457.67	——	——
Profit from Dartonfield Group ..	90,069.00	78,166.34	——	11,902.66	Lower sale prices and increased salaries.
Sundry Receipts	4,000.00	1,239.17	——	2,760.83	No charge made for electric lights.
Government Grant for Smallholdings Work	189,060.00	264,060.00	75,000.00	——	Excess is grant from Rubber Controller for establishment of rubber nurseries for smallholders.

RUBBER RESEARCH INSTITUTE OF CEYLON

STATEMENT OF EXCESS AND SAVINGS ON VOTES 1952.

EXPENDITURE

Head of Estimate	Account	Estimate Rs.	Capital Rs.	Revenue Rs.	Excess Rs.	Savings Rs.	REMARKS
1.	ADMINISTRATION OF THE BOARD :						
	Travelling Expenses of Board Members ..	4,500.00	—	2,018.67	—	2,481.33	Over Estimate.
2.	EMOLUMENTS OF SENIOR SCIENTIFIC STAFF ..	129,251.00		127,802.74		1,448.26	Transfer of 1 Research Asst. to S. H. Dept. during the year.
3.	EMOLUMENTS OF JUNIOR SCIENTIFIC STAFF ..	30,432.00		30,523.35	91.35		
4.	LIBRARY & PUBLICATIONS :						
	A. Library	5,000.00		4,039.07		960.93	Binding Journals not complete
	B. Publications	5,000.00		7,861.40	2,861.40		More publications issued and higher printing costs.
5.	SMALLHOLDINGS WORK :						
	A—F & H. Emoluments of Staff ..	186,168.00		189,771.55	3,603.55		Increased salary scales.
	G & I—J. Travelling and General Expenses	91,310.00		65,856.45		25,453.55	Non employment of full staff and S.H.P.O. on leave for 6 months.
6.	LABORATORY :						
	A. Equipment & Working Expenses ..	28,000.00	12,648.59	23,498.20	8,146.79		Equipment for New Officers
	B. Furniture Replacements	500.00		602.27	102.27		Under estimate
7.	FIELD & FACTORY EXPERIMENTS :						
	A. Field Experiments	15,145.00		18,547.19	3,402.19		New experiments undertaken.
	B. Factory Experiments	16,000.00		410.93		15,599.07	Experiments postponed for 1953.
8.	OFFICE :						
	A—C. Emoluments of Office Staff ..	28,030.00		34,847.90	6,817.90		Increased salary scales.
	D. Stationery & Office Equipment ..	4,500.00		4,161.20		338.80	Economies
	E. Postages & Telegrams	3,000.00		2,813.59		186.41	Economies
	F. Advertising	1,000.00		1,074.09	74.09		
	G. Telephone	3,200.00		1,845.31		1,354.69	New telephone line not installed
	H. Audit	1,600.00		1,600.00			

STATEMENT OF EXCESS AND SAVINGS ON VOTES—*(Continued)*.

Head of Estimate	Account	Estimate Rs.	EXPENDITURE Capital Rs.	Revenue Rs..	Excess Rs.	Savings Rs.	REMARKS
9.	TRAVELLING EXPENSES OF STAFF ..	18,000.00		26,917.73	8,917.73		Unanticipated expenses incurred overseas by Director and Chemist.
10.	MAINTENANCE OF BUILDINGS & ETC. :						
	A. General Buildings	1,500.00		2,101.81	601.81		More repairs undertaken
	B. Bungalows	8,000.00		5,726.42		2,273.58	Over estimate.
	C. WATER & POWER SUPPLY	5,000.00		6,869.86	1,869.86		Unexpected repairs to Motors, Batteries and Engine.
	D. Bungalow Furniture Replacements ..	3,000.00		1,861.48		1,138.52	Less replacements.
	E. Motor Vehicles	5,500.00		6,510.43	1,010.43		Unexpected repairs to vehicles.
11.	MISCELLANEOUS ITEMS SHARED WITH ESTATE :						
	A. Dartonfield Group General Charges ..	81,426.00		101,713.04	20,287·04		Increased Salaries etc.
	B. Upkeep of Roads & Grounds ..	1,875.00		2,760.99	885.99		Unforeseen expenditure on repair works on roads etc.
	C. Upkeep of Bungalow Premises ..	7,800.00		7,151.45		648.55	Over estimate.
	D. Factory Upkeep	9,975.00		9,491.66		483.34	do
	F. Power Supply	9,970.00		14,251.91	4,281.91		Increased fuel consumption and increased salaries.
12.	OTHER CHARGES:						
	A. Contribution to London Advisory Committee	31,200.00		30,666.67		533.33	Difference in rate of exchange.
	B. Contingencies	1,500.00		1,222.28		277.72	Over estimate.
	C. Insurance Charges	8,500.00		6,276.63		2,223.37	Non completion of building programme.
	D. Staff Provident Fund	63,500.00		64,428.07	928.07		Under estimate.
	E. Passages	15,000.00		15,000.00			
	F. Entertainment Allowance	500.00		132.00		368.00	Less entertainment.
	G. Dearness Allowance to Staff ..	90,000.00		88,939.50		1,060.50	Over estimate.
	H. Assistant Staff Medical Fund ..	3,600.00		6,061.89	2,461.89		Increase in rates of contribution.
	I. Social Services	2,000.00		1,199.04		800.96	Economies.
	J. Senior Staff Medical Scheme ..	—		2,572.72	2,572.72		Introduced during the year on trial basis.
13.	DEPRECIATION	42,000.00		44,024.29	2,024.29		Under estimate.

STATEMENT OF EXCESS AND SAVINGS ON VOTES—(*Continued*).

Head of Estimate	Account	Estimate	EXPENDITURE Capital	Revenue	Excess	Savings	REMARKS
14.	CAPITAL ACCOUNT :						
A.	Upkeep of Dartonfield Group Immature Areas	60,996.00	65,617.14		4,621.14		Under estimate on weeding and diseases.
B.	Planting Coffee in 1949 Clearing Hedigalla	4,117.00	1,740.69			2,376.31	Economies.
C.	Replanting 35 Acres at Dartonfield ..	18,069.00	20,022.00		1,953.00		Under Estimate on weeding
D.	Planting 75 Acres at Hedigalla ..	37,438.00	41,725.15		4,287.15		83 acres planted
E.	Six Double Labourers' Cottages & Latrines & 6 Water Seal Latrines ..	40,500.00	37,070.21			3,429.79	Payments not complete
F.	School & Creche at Hedigalla ..	12,500.00	8,415.75			4,084.25	Work not complete.
G.	School-matser's Quarters & Co-op : Stores at Hedigalla	16,000.00	11,816.84			4,183.16	do
H.	Converting Engine-Driver's Quarters into workshop	4,500.00	1,003.14			3,496.86	do
I.	Indoor Sanitation for J.S. Bungalows at Nivitigalakele and Hedigalla ..	7,000.00	3,687.05			3,312.95	do
J.	Alterations to Estate Office ..	1,100.00	1,310.81		210.81		Under estimate.
K.	Renovating Dartonfield and Nivitigalakele Conductors' Bungalows ..	3,500.00	3,044.22			455.78	Work not Complete.
L.	Extra Doors and Converting Storerooms in 15 J.S. Bungalows to Dining Rooms	8,000.00	8,207.94		207.94		Under estimate. Extra provision obtained in 1953.
M.	Laboratory and Factory Equipment for Chemist	115,262.00	36,881.25			78,380.75	Payments not complete.
N.	Furniture and Fixed Equipment ..	6,450.00	6,276.00			174.00	Economies.
O.	Workshop Equipment	8,000.00	6,540.67			1,459.33	Not fully equipped yet.

STATEMENT OF EXCESS AND SAVINGS ON VOTES (Contd.)

EXPENDITURE

Head of Estimate	Account	Estimate Rs.	Capital Rs.	Revenue Rs.	Excess Rs.	Savings Rs.	REMARKS
14	CAPITAL ACCOUNTS (Contd.)						
	P. Scrap Washer for Factory ..	20,000.00	40.00			19,960.00	Not purchased yet.
	O. Water & Power Supply Dartonfield ..	13,000.00	7,995.34			5,004.66	Work in Progress.
	R. Hedigalla Cart Road	16,716.00	6,031.34			10,684.66	Proposed extension not undertaken due to labour shortage.
	S. Widening Road to 7½ acres Field (Dartonfield)	2,500.00	2,762.14		262.14		Underestimate.
	T. One Cattle Bridge (Dartonfield) ..	3,400.00	500.18			2,899.82	Work not Complete.
	U. Road to New Bungalows—Dartonfield	1,000.00	922.22			77.78	Economies
	V. Colombo Plan Exhibition ..	—		2,642.50	2,642.50		Re-vote from 1951 not obtained.
	W. Survey of Dartonfield	2,200.00	2,206.35		6.35		——
	X. Furniture for Junior Staff Bungalows ..	6,325.00	6,427.25		102.25		Under estimate.
	Y. Equipment for Staff Club House ..	4,500.00	4,613.25		113.25		Under estimate
	Z. Factory Equipment for Dartonfield ..	73,025.00	—			73,025.00	Equipment on order.
	A1. Tunnel Type Smoke House Dartonfield	38,700.00	—			38,700.00	Work not started.
	B1. Drying Chamber Dartonfield ..	15,500.00	14,015.90			1,484.10	Payments not complete.
	C1. Dartonfield Factory Extension ..	97,975.00	74,846.71			23,128.29	Work in progress.
	D1. Electrical Lighting Set for Dartonfield ..	130,200.00	30,824.35			99,375.65	On order.
	E1. Green House for Mycological Dept. ..	2,000.00	1,804.91			195.09	Economies.
	F1. One Intermediate Staff Bungalow at Dartonfield	43,121.00	27,271.95			15,849.05	Payments not complete
	G1. Two Junior Staff Bungalows at Dartonfield	31,141.00	31,549.16		408.16		Under estimate on site cutting etc.
	H1. Eight Double Labourers' Cottages at Hedigalla	30,903.00	31,487.00		584.00		do
	I1. Four Double Labourers' Cottages at Dartonfield	13,671.00	13,909.16		238.16		do

STATEMENT OF EXCESS AND SAVINGS ON VOTES (Contd.)

EXPENDITURE

Head of Estimate	Accounts	Estimate Rs.	Capital Rs	Revenue Rs.	Excess Rs.	Savings Rs.	REMARKS
14	CAPITAL ACCOUNT (Contd.)						
	J1. Stores & Garages at Dartonfield ..	4,574.00	1,541.91			3,032.09	Work not completed.
	K1. Indoor Sanitation for Junior Staff Bungalows at Dartonfield ..	10,570.00	4,755.61			5,814.39	do
	L1. Hedigalla Water Supply	10,373.00	2,293.45			8,079.55	do
	M1. R.R.I. Staff Club House	10,217.00	12,014.22		1,797.22		Extra expenses on site cutting and steps.
	N1. Electric Lights for Junior Staff Bungalows (Nivitigalakele)	3,500.00	2,735.61			764.39	Work not completed.
	O1. Hand Rollers for Hedigalla ..	2,150.00	1,511.06			638.94	Economies
	P1. Rubber Drying House for Hedigalla ..	2,963.00	4,211.82		1,248.82		Cost of materials under estimated
	Q1. Latex Tank for Hedigalla	—	—				———
	R1. Latex Tank for Nivitigalakele ..	261.00	263.10		2.10		
	S1. Renovating Buildings	8,651.00	9,064.07		413.07		More renovation undertaken
	T1. Six Single and 14 Double Water Seal Latrines	800.00	610.26			189.74	Work not completed.
	U1. Widening Path to Chummery ..	409.00	770.40		361.40		More work had to be done after heavy showers of rain
	V1. Additional Water Supply at Dartonfield	4,485.00	3,542.87			942.13	Work not completed.
	W1. Extension to Superintendent's Bungalow	5,500.00	6,229.58		729.58		Under estimate.
	X1. Store for Sulphur	4,030.00	2,685.82			1,344.18	Work not completed.
	Y1. Portable Gantry for Factory ..	2,000.00	1,840.00			160.00	Installation not completed.
	Z1. Sulphur Dusting Equipment ..	12,500.00	10,884.55			1,615.45	Equipment not complete.
	Z2. 1 Junior Staff Bungalow & Extension to 2 Chummeries	46,000.00	986.45			45,013.55	Tenders called for, work not undertaken until end of year.
	Z3. 2 Portable Aerogen Gas Machines and sheds for Chemist & Agronomist	6,500.00				6,500.00	Purchase postponed.

ESTIMATES FOR 1954

(Adopted by the Board, 26th October, 1953)

ESTIMATE OF INCOME FOR 1954

1.	Cess Collections	Rs.	985,600
2.	Government Grant for Smallholdings work	,,	206,600
3.	Interest	,,	92,000
4.	Sale of Publications	,,	2,500
5.	Profit from Dartonfield Group Working	,,	38,246
6.	Sundry Receipts	,,	2,500
		Rs.	1,327,446

ESTIMATE OF EXPENDITURE FOR 1954

1.	**Administration of the Board :**				
	(*a*) Travelling Expenses of Board Members	Rs.	3,000		
	(*b*) Entertainment of Board Members	,,	250		
				Rs.	3,250
2.	**Personal Emoluments :**				
	(*a*) Senior Scientific Staff	Rs.	143,200		
	(*b*) Junior Scientific Staff	,,	43,120		
				,,	186,320
3.	**Library and Publications :**				
	(*a*) Library	Rs.	6,000		
	(*b*) Publications	,,	7,500		
				,,	13,500
4.	**Smallholdings Department :**				
	(*a*) Salaries and Allowances	Rs.	248,018		
	(*b*) Travelling and General Expenses	,,	88,910		
				,,	336,928
5.	**Laboratory :**				
	(*a*) Equipment & Working Expenses	Rs.	40,000		
	(*b*) Furniture Replacements	,,	600		
				,,	40,600
6.	**Field and Factory Experiments :**				
	(*a*) Field Experiments	Rs.	37,700		
	(*b*) Factory Experiments	,,	14,400		
				,,	52,100
7.	**Office :**				
	((*a*) Salaries of Office Staff	Rs.	42,220		
	(*b*) Stationery & Office Equipment	,,	5,500		
	(*c*) Postages & Telegrams	,,	4,500		
	(*d*) Advertising	,,	1,000		
	(*e*) Telephone	,,	1,700		
	(*f*) Audit	,,	1,600		
				,,	56,520
8.	**Travelling Expenses of Staff :**				
	Officers' Expenses			,,	22,000
		Carried Forward		Rs.	711,218

	..Brought Forward ..			Rs.	711,218
9. Maintenance Charges :					
(*a*) General Buildings ..	..	,,	3,000		
(*b*) Bungalows ..	..	,,	10,000	,,	
(*c*) Water & Power Supply	..	,,	28,210		
(*d*) Furniture ..	..	,,	1,500		
(*e*) Motor Vehicles ..	..	,,	11,375		
				,,	54,085
10. Miscellaneous items shared with Estates :					
(*a*) Dartonfield Group General Charges		Rs.	108,704		
(*b*) Upkeep of Building Premises ..	..	,,	7,925		
(*c*) Factory Upkeep ..	..	,,	8,565		
				,,	125,194
11. Other Charges :					
(*a*) Contribution to London Advisory Committee ..	..	Rs.	5,000		
(*b*) Contribution to B.R.P.R.A.	..	,,	30,000		
(*c*) Contingencies ..	..	,,	1,500		
(*d*) Insurance Charges	..	,,	8,500		
(*e*) Staff Provident Fund	..	,,	85,000		
(*f*) Passages ..	..	,,	15,000		
(*g*) Entertainment Allowance	..	,,	500		
(*h*) Dearness Allowance to Staff	..	,,	111,350		
(*i*) Assistant Staff Medical Fund	..	,,	8,500		
(*j*) Senior Staff Medical Scheme	..	,,	3,000		
(*k*) Social Services ..	..	,,	2,000		
				,,	270,350
12. Depreciation ..	..		..	,,	100,450
				Rs.	1,261,297

CAPITAL EXPENDITURE

1. Agricultural Development ..	..	Rs.	254,373
2. Buildings ..	..	,,	134,825
3. Water and Power Supply	..	,,	39,150
4. Furniture and Laboratory Equipment	..	,,	93,300
5. Cart Roads ..	..	,,	50,500
		Rs.	572,148

SUMMARY

Income ..	..		..	Rs.	1,327,446
Expenditure :					
Revenue ..	..	Rs.	1,261,297		
Capital ..	..	,,	572,148		
				,,	1,833,445
Excess of Expenditure over Income	..		..	Rs.	505,999

Printed by
THE DAILY NEWS PRESS
COLOMBO